A PROFILE OF CHILDREN IN THE AVIAN PARK AND ZWELETEMBA SETTLEMENTS IN THE BREEDE VALLEY LOCAL MUNICIPALITY OF THE WESTERN CAPE PROVINCE, SOUTH AFRICA

by
Hilletjie Elizabeth Koornhof

Thesis presented in partial fulfilment of the requirements for the degree Master of Nutrition in the Faculty of Medicine and Health Sciences at Stellenbosch University

Supervisor: Prof MH McLachlan
Co-supervisor: Prof M Faber
Statistician: Prof JH Nel

April 2014

DECLARATION

By submitting this thesis electronically, I, Hilletjie Elizabeth Koornhof, declare that the entirety of the work contained therein is my own, original work, that I am the sole author thereof (save to the extent explicitly otherwise stated), that reproduction and publication thereof by Stellenbosch University will not infringe any third party rights and that I have not previously in its entirety or in part submitted it for obtaining any qualification.

Date: 28 November 2013

ABSTRACT

Objectives: To describe the mothers/ primary caregivers' (PCGs) and children' anthropometric status; their household food security and poverty in relation to type of housing; and compare households receiving and not receiving a Child Support Grant (CSG) in relation to mothers/ PCGs' anthropometric status, their dietary diversity, age, employment, educational level, monthly household income, size, food security and children's anthropometric status.

Design: Cross sectional, descriptive study.

Subjects: Mothers/ PCGs (443) and their children from 211 households in Avian Park and 242 Zweletemba in Worcester, Western Cape Province.

Methods: Data collected by interviewer administered questionnaires included socio-demographic data, Lived Poverty Index, Household Food Insecurity Access Scale (HFIAS) and dietary diversity score (DDS). Anthropometric measurements included weight, height and waist circumference (WC) of mothers/ PCGS and weight, height and mid-upper-arm circumference of children. Households living in formal (brick houses, town houses, flats) and informal (squatter shacks, huts) houses, and households receiving CSGs and those without CSG, were compared using X^2-test for categorical data and the independent t-test for continuous data.

Results: Prevalence of stunting, underweight and wasting in children was 20.7%, 5.6% and 1.2% respectively. Overweight and obesity occurred in 27% and 37% of mothers/PCGs respectively and together with a mean WC (89.5 cm; SD 16.7) indicated an increased risk for non-communicable diseases. Food security existed in 63.1% households. Formal households were more food secure than informal households (68% versus 50%; p=0.0004) and fewer mothers/ PCGs of formal households had a DDS < 4 (52.2% versus 64.7%; p = 0.0157). The healthier socio-economic situation in formal households compared to informal households was shown by the higher monthly income (R3 479 versus R2 316; p = 0.0009) and Household Asset Index (2.24 versus –5.31; p <0.0001).

Age, marital status, education level and employment status of mothers/primary caregivers in CSG households and non-CSG households were similar. Household size was larger (p<0.0001) in CSG (median = 5 persons) versus non-CSG households (median = 4 persons); CSG households had more people per room (2.7 [SD 1.5] versus 2.3 [SD 1.2]; p=0.0037). CSG households had lower monthly income than non-CSG households (R2 723 [SD R3 297] versus R4 520 [SD R6 464]; p=0.0033). Mean HFIAS scores showed more food insecurity in CSG households than non-CSG (3.55 versus 2.37; p= 0.0178), but dietary diversity was similar. Stunting in children was higher in CSG (34.9%) versus non-

CSG (22.7%) households. CSG mothers/PCGs had larger (p = 0.021) waist circumferences (90.0 cm; SD = 16.8) than non-CSG mother/PCGs (88.5 cm; SD = 16.5)

Conclusion: Childhood malnutrition and maternal overweight /obesity co-existed. Dietary diversity of all mothers/ PCGs was low. The assessment of type of housing and social security showed children in informal housing households had a poorer socio-economic situation and children in CSG households also experienced more monthly income poverty and household food insecurity. The level of stunting was higher in CSG households. Improving low dietary diversity should be a priority in interventions addressing food insecurity, taking into consideration this may be more difficult to achieve in informal households and CSG households.

OPSOMMING

Doel: Om die antropometriese status van moeders/ primêre versorgers en hul kinders; hul huishoudelike voedselsekerheid en armoede met betrekking tot tipe behuising waarin hul woon, te beskryf; asook om huishoudings wat ‘n kindersorgtoelaag ontvang te vergelyk met die daarsonder in terme van die antropometriese status van moeders/ primêre versorgers, hul dieetdiversiteit, ouderdom, indiensneming/ werkstatus, opvoedkundige vlak, huishoudelike maandelikse inkomste en grootte, voedselsekerheid en die antropometriese status van hul kinders.

Ontwerp: ‘n Beskrywende, deursnit studie.

Deelnemers: Moeders/ primêre versorgers (447) en hul kinders van 211 huishoudings in Avian Park en 242 in Zweletemba.

Metodes: Data-insameling is gedoen met onderhoudvoerder geadministreerde vraelyste insluitend sosio-demografiese inligting, die belewing-van-armoede-indeks, huishoudelike voedselonsekerheid-en-toegangskaal en dieetdiversiteitstelling. Antropometriese metings van moeders/ primêre versorgers het behels gewig, lengte en middelyfomtrek en gewig lengte en bo-armomtrek van kinders. Huishoudings woonagtig in formele (baksteenhuise, meenthuise, woonstelle) en informele huise (plakkershutte), en huishoudings wat die kindersorgtoelaag ontvang en nie, is vergelyk met behulp van die X^2-toets vir kategoriese data en ‘n onafhanklike t-toets vir aaneenlopende data.

Resultate: Die voorkoms van dwerggroei, ondergewig en uittering in kinders was onderskeidelik 20.7%, 5.6% en 1.2%. Oorgewig en vetsug het onderskeidelik voorgekom by 27% en 37% van moeders/ primêre versorgers en hul gemiddelde middelyfomtrek was 89.5 sentimeter (SA 16.7), wat aanduidend is van ‘n verhoogde risiko vir nie-oordraagbare siektes. Voedselsekerheid het voorgekom in 63.1% van huishoudings. Formele huishoudings het meer voedsekerheid ervaar as informele huishoudings (68% versus 50%; p=0.0004) en minder formele huishouding moeders/ primêre versorgers het ‘n dieetdiversiteitstelling < 4 (52.2% versus 64.7%; p = 0.0157) gehad. Beter sosio-ekonomiese omstandighede van formele huishoudings in vergelyking met informele huishoudings was sigbaar in hul hoër maandelikse inkomste (R3 479 versus R2 316; p = 0.0009) en huishoudelike bates-indeks (2.24 versus –5.31; p <0.0001).

Die ouderdom, huwelikstatus, opvoedkundige vlak en werkstatus van moeders/ primêre versorgers in huishoudings wat ‘n kindersorgtoelaag ontvang en die huishoudings daarsonder was soortgelyk. Huishoudingsgrootte was groter (p<0.0001) in kindersorgtoelaag- (mediaan = 5 persone) versus geen-kindersorgtoelaaghuishoudings (mediaan = 4 persone); In kindersorgtoelaaghuishoudings het meer persone ‘n kamer gedeel (2.7 [SA 1.5] versus 2.3 [SA 1.2]; p=0.0037). Die maandelikse inkomste in

kindersorgtoelaaghuishoudings was laer as in dié daarsonder (R2 723 [SA R3 297] versus R4 520 [SA R6 464]; p=0.0033). Die huishoudelike voedselonsekerheid-en-toegangskaal-tellings het meer voedselonsekerheid (p = 0.0178) getoon in kindersorgtoelaaghuishoudings as in huishoudings daarsonder (3.55 versus 2.37; p= 0.0178), maar hul dieetdiversiteit was dieselfde. Dwerggroei was meer in kindersorgtoellaagkinders (34.9%) versus geen-kindersorgtoelaagkinders (22.7%). Die gemiddelde middellyfomtrek van kindersorgtoellaagmoeders/ -primêre versorgers was groter (t-toets: p = 0.021) (90.0 cm; SA = 16.8) as die van moeders/ primêre versorgers wat nie ‘n kindersorgtoelaag (88.5 cm; SA = 16.5) ontvang het nie.

Samevatting: Wanvoeding in kinders, tesame met oorgewig en obesiteit in moeders/ primêre versorgers is waargeneem Die dieetdiversiteit van die moeders/ primêre versorgers was laag. Die ontleding van die rol van behuising en sosiale sekerheid het getoon dat die sosio-ekonomiese omstandighede van kinders woonagtig in informele behuising, asook die waarvoor moeders/ primêre versorgers ‘n kindersorgtoelaag ontvang het, is blootgestel aan meer inkomste-armoede en voedselonsekerheid in hul huishoudings. Die verbetering van lae dieetdiversiteit moet ‘n prioriteit wees in intervensieprogramme om voedselsekerheid aan te spreek, met inagneming dat die bereiking daarvan moeilker mag wees om in informele en kindersorgtoelaag-huishoudings.

ACKNOWLEDGEMENTS

I would like to thank:

- My Father and Saviour, who has given me the wisdom, ability and strength to do this.
- My husband, Nick, and dear children Pieter, Ernestine and Helena, who supported me and allowed me the time to do this thesis.
- My dear mother, who passed away during the time of data collection and who inspired me to follow my heart's desires.
- My dear twin sister, for her loving and caring support and for always being there for me.
- My study supervisors, Milla and Mieke, for being such wonderful mentors.
- Prof Hannelie Nel for assisting with the statistical analysis and interpretation.
- Lize Vorster for assisting with the language editing.
- My colleagues Renee, Lisanne, Lynette, Ronel, Alta, Ancios, Evette, Jannicke, Tani and Maritha for their support and encouragement.
- The fieldworkers who assisted with the CNSP data collection.
- All the families in Avian Park and Zweletemba who were willing to take part in this study.
- All my friends and family who so diligently prayed for me and stood in faith with me whilst finalising this project.
- This research would not have been possible without the financial backing from The Hope Project of Stellenbosch University, under which the Community Nutrition Security Research Project falls within the scope of the Food Security Initiative.

CONTRIBUTIONS BY PRINCIPAL RESEARCHER AND FELLOW RESEARCHERS

The principal researcher, Hilletjie Elizabeth Koornhof was a member of the team that developed the idea and the protocol for the Community Nutrition Security Research Project (CNSP) in the Breede Valley, Western Cape Province, South Africa. This baseline study was approved by the Human Research Committee of the Faculty of Health Sciences, Stellenbosch University Ethics Committee (N10/11/368). Prof MH McLachlan was also the principal investigator of the CNSP. The principal researcher was actively involved with the training of the field workers, pilot study and the data collection for the baseline project.

Subsequently, the protocol for this descriptive study, which forms part of the CNSP baseline study and entails a secondary analysis of selected data, was written by the principle researcher. The principal researcher wrote the literature review and the two articles. Prof J.H. Nel, the statistician, who was responsible for the development of the data-basis and capturing of the CNSP data, provided assistance with the analysis and the interpretation of the data. The principal researcher received valuable guidance, assistance and input during all stages by of the master's research project from her supervisor and co-supervisor, Prof. M.H. McLachlan and Prof. M. Faber.

Contents

LIST OF ABBREVIATION & ACRONYMS

BMI	Body Mass Index
CSG	Child Support Grant
DG	Disability Grant
DSD	Department of Social Development
EPRI	Economic Policy Research Institute
FAO	Food and Agriculture Organization
H/A	Height-for-age
HAZ	Height-for-age Z-score
HFIAS	Household Food Insecurity Access Scale
HIV	Human Immunodeficiency Virus
IDDS	Individual Dietary Diversity Score
IFSS	Integrated Food Security Strategy
INP	Integrated Nutrition Programme
KIDS	KwaZulu-Natal Income Dynamics Study
MDG	Millennium Development Goal
NFCS	National Food Consumption Survey
NFCS-FB	National Food Consumption Survey: Fortification Baseline
PCG	Primary caregiver
PHC	Primary health care
RDP	Reconstruction and Development Programme
SA	South Africa
SANHANES-1	South African National Health and Nutrition Examination Survey
SASSA	South African Social Security Agency
STATSSA	Statistics South Africa
UNICEF	United Nations Children's Fund
W/A	Weight-for-age
WAZ	Weight for Age Z-score
W/H	Weight-for-height
WHZ	Weight-for-height Z-score
WFP	World Food Programme
WHO	World Health Organization

LIST OF TABLES

LIST OF FIGURES

LIST OF APPENDICES

GLOSSARY OF TERMS

Child support grant (CSG)	A child support grant is a cash transfer paid monthly to the qualifying primary caregiver for every child born on or after 1 October 1994 up to the age of 18 years, to supplement household income. Child and caregiver must be South African citizens.[1] It is important to note that qualifying criteria are applied to ensure that the targeted beneficiaries, i.e. caregivers of children born on or after 1 October 1994 living in poverty are reached.[1]
Food security	Food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs, and food preferences for an active and healthy life.[2]
Household food security	At the household level, household food security refers to the ability of the household to secure, either from its own production or through purchases, adequate food for meeting the dietary needs of all members of the household.[3]
Household food insecurity	Household food insecurity exists when all members do not at all times, have physical, social and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life. The four pillars of food security are availability, access, utilisation and stability. The nutritional dimension is integral to the concept of food security.[4]
Nutrition security	The provision of an environment that encourages and motivates society to make food choices consistent with short and long-term good health.[5]

REFERENCES:

1. Martin P. Government-funded programmes and services for vulnerable children in South Africa. Cape Town: HSRC Press; 2010.
2. Food and Agriculture Organization, World food summit. (1996) [Online] http://www.fao.org/docrep/x2051e/x2051e00.HTM#P283_30407 [2013, 11 August]
3. Food and Agriculture Organization, Agriculture and Food Protection Department. [Online] http://www.fao.org/ag/agn/nutrition/household_en.stm [2012, 13 August]
4. Declaration of the World Summit on Food Security. Rome, 16-18 November 2009 [Online] Available: http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf [2013, 11 September]
5. Position of the American Dietetic Association: Food Insecurity in the United States. Journal of the American Dietetic Association 2010;110:1368-1377 [Online] http://www.eatright.org/About/Content.aspx?id=8361 [2013, 19 October]

CHAPTER 1 – GENERAL INTRODUCTION

1.1 Introduction

The project "A profile of children in the Avian Park and Zweletemba settlements in the Breede Valley local municipality of the Western Cape province, South Africa" forms part of the Community-based Nutrition Security Project (CNSP) of the Division of Human Nutrition.

The aim of this secondary analysis was to describe the nutritional status, household food security, socio-demographic and socio-economic situation, access to the CSG grant and the poverty experience of mothers/primary caregivers and their children, 0-36 months old, in Avian Park and Zweletemba, in the Breede Valley Local Municipality of the Western Cape Province, South Africa. Ethics approval was obtained from Health Research Ethics Committee 1 of Stellenbosch University (SU). (Ethics reference: S13/05/097)

The CNSP is part of the Stellenbosch University Food Security Initiative (FSI) and is funded by the Stellenbosch University Council. The planning of the CNSP began in 2009 and when the planning of the project took place, it was decided to use a phased approach with a separate protocol for each phase.[1] The planning for phase 1, the cross-sectional baseline assessment of a community took place in 2010 and followed a participatory planning process. The identification of the community for the project was based on the outcome of a "composite human needs index" assessment performed in collaboration with the Centre for Geographical Analysis, SU.[2] The "composite human needs index" assessment identified several vulnerable communities suitable for food security research. The final decision to execute the study in the Breede Valley area was influenced by the fact that Stellenbosch University and the Faculty of Medicine and Health Sciences had initiated the building of the UKWANDA Rural Clinical School in Worcester, the main town in the Breede Valley Municipality.

One of primary aims of the CNSP is to assist the selected communities to achieve nutrition security, which is defined by the American Dietetic Association as "the provision of an environment that encourages and motivates society to make food choices consistent with short and long-term good health".[3] The aims of the CNSP are based on several of the Millennium Development Goals[4] (e.g. reduction in hunger, promoting gender equality and empowerment of women, a reduction in child mortality

and improvement of maternal health) and will be established with the participation of community representatives.

With the development and planning of the CNSP project design,[1] it was decided to adopt a multi-method approach to study the linkages between community food security and child nutritional status and to investigate how the poorer households interact with the food system. The protocol for the first phase, the baseline study, included a number of different tools and questionnaires that would enable the team to develop a comprehensive understanding of the immediate and underlying factors that influence growth in young children in the selected vulnerable communities in the Western Cape, and to explore how vulnerable households engage with the food system. The protocol to execute the CNSP baseline study in the Breede Valley, Western Cape Province, South Africa, was approved by the Human Research Ethics Committee of the Faculty of Health Sciences, Stellenbosch University Ethics Committee in November 2010.[5] Avian Park and Zweletemba, two residential areas in the Breede Valley Local Municipality, were selected as the specific research communities in which the baseline study would be performed.

The methodology included the collection of quantitative and qualitative data.

The following research questions were asked in the baseline study:

- "What is the nutritional status of children 0 - 36 months old, and their mothers/primary caregivers in peri-urban households in selected communities in the Breede Valley district of the Western Cape?
- How do peri-urban households with children, 0 – 36 months old, engage with the food system?
- What are the linkages between patterns of interaction with the food system and levels of household food security?
- How do household food security, health security and specific social determinants interrelate to influence children's nutritional status in selected vulnerable communities in the Breede Valley?
- What is the community's food security situation in selected communities in the Breede Valley?" [5]

Anthropometric measurements were performed on mothers/caregivers and children; blood samples were collected from mothers and children older than 12 months; and quantitative data was collected at household level using the following questionnaires:

1) Socio-demographic questionnaire, which includes the Living Poverty Index questions
2) Household food insecurity assess scale

3) Dietary diversity questionnaire
4) Food procurement and household food inventory
5) Quantitative food frequency questionnaire
6) 24-hour recall of dietary intake of the mother/primary care giver and of the child
7) Infant and young child feeding practices questionnaire
8) Mother and child health information [5]

The qualitative data was collected by means of focus group discussions, which were held with a wide range of different stakeholders in the community. The topics of household food security and food shopping patterns were discussed in the focus group discussions with individuals. Questions regarding food insecurity in the community, food availability, food access and food assistance programmes were also included in the focus group discussion with community leaders.

The data collection for the baseline study took place in the first half of 2011. Data-collection was done by fieldworkers who were purposively trained, to equip them with knowledge, understanding and skills to collect the data using the specific questionnaires included in the study. The recruitment of applicants to train as field workers was done in collaboration with community leaders and community based organisation in Avian Park and Zweletemba. The training of fieldworkers was performed by the project leader and her team, and took place from 21 to 25 February 2011 and was followed by the pilot study which took place from 14 to 17 March, 2011. The data collection period commenced at the beginning of April and continued until the end of July 2011.

1.2 Study aim and objectives

1.2.1 Aim

The aim of this study, a secondary analysis of selected quantitative data of the CNSP, was to describe the nutritional status, household food security, socio-demographic and socio-economic situation, access to the CSG grant and the poverty experience of mothers/primary caregivers and their children, 0-36 months old, in Avian Park and Zweletemba, in the Breede Valley Local Municipality of the Western Cape Province, South Africa

1.2.2 Objectives

The specific objectives of this study were:

1. To describe the anthropometric status of the mothers/ primary caregivers and their children, 0-36 months old, in terms of the prevalence of wasting, underweight, stunting and overweight/ obesity.

2. To describe household food security and poverty in the households in terms of individual dietary diversity (IDD) of the mothers, a household food insecurity access scale and poverty experience.
3. To compare household food security and poverty between formal and informal settings.
4. To determine the number of households receiving a Child Support Grant (CSG) or CSGs.
5. To describe the relationship between the anthropometric status of the mothers/ primary caregivers and their children, and their poverty experience, as measured with the Lived Poverty Index, household income, household assets, individual dietary diversity and household food insecurity access.
6. To compare households with and without the CSG, in terms of food security, poverty, household size, household income and assets, level of education, employment and work status of household members, poverty, and the anthropometric status of mothers / primary caregivers and their children.

1.3 Thesis outline

The structure of this thesis is:

- Chapter 1 – a brief introduction describing the Community-based Nutrition Security Project and the aims and objectives of the project "A profile of children in the Avian Park and Zweletemba settlements in the Breede Valley local municipality of the Western Cape province, South Africa".
- Chapter 2 – a review of literature regarding the concept of malnutrition and the factors associated with malnutrition in South Africa
- Chapter 3 –"Household food and nutrition security in Avian Park and Zweletemba". This article includes the outcomes related to objectives 1, 2, 3 and 5.
- Chapter 4 – "Household characteristics and anthropometric status of recipients of the child support grant in Avian Park and Zweletemba". This article covers the outcomes related to objectives 4 and 6.
- Chapter 5 – the concluding chapter with a general discussion, general conclusion, recommendations and suggestions for future research.

The plan is to submit the first article: *Household food and nutrition security in Avian Park and Zweletemba* for publication in the *Public Health Nutrition* journal. The second article *Household characteristics and anthropometric status of recipients of the child support grant in Avian Park and Zweletemba* will be submitted for publication in

Maternal & Child Nutrition. In the thesis the references have been written in Vancouver style. Presently, for the purpose of the thesis, the number of words in the first article is more than the recommendations in the author guidelines of *Public Health Nutrition.* The references of the articles will be adapted according to the specified author guidelines of the respective journals, and the content of the first article will shortened before submitting it for publication once the thesis has been accepted. All aspects regarding the Lived Poverty Index problem will be excluded from the article due to the problem that was identified when the data was analysed.

1.4 References

1. Executive summary, Stellenbosch University Food Security Initiative. A Community-Based Nutrition Security Project. Division of Human Nutrition. July 2009.
2. Martin P. Government-funded programmes and services for vulnerable children in South Africa. Cape Town: HSRC Press; 2010.
3. Position of the American Dietetic Association: Food Insecurity in the United States. Journal of the American Dietetic Association 2010;110:1368-1377 [Online] http://www.eatright.org/About/Content.aspx?id=8361 [2013, 19 October]
4. UNICEF. Millennium Development Goals. [Online] http://www.unicef.org/mdg/index_aboutthegoals.htm [2013, 19 October]
5. McLachlan MH and co-workers. Division of Human Nutrition, Stellenbosch University, September 2010. Stellenbosch University Food Security Initiative. A Community Nutrition Security Research Project in the Breede Valley, Western Cape Province, South Africa – baseline study. Final research protocol, 10 February 2011. Approved by the Human Research Committee of the Faculty of Health Sciences, Stellenbosch University Ethics Committee (N10/11/368)

CHAPTER 2 – LITERATURE REVIEW

2.1 The current situation regarding malnutrition in children and women in South Africa

Four national studies have assessed the nutritional status of children in South Africa. Two of these studies, i.e. the National Food Consumption Survey (NFCS) of 1999[1]and the National Food Consumption Survey Fortification Baseline (NFCS-FB-1) of 2005,[2] included children aged 1 to 9 years old. Both studies reported a prevalence of about one in five children being stunted, and one in ten being underweight. Stunting is the most common nutritional disorder affecting children, with the highest prevalence amongst younger children, aged 1-3 years, as well as children living in rural areas.[1,,2] The NFCS reported a 17.1% prevalence of overweight and obese children combined whilst the NFCS-FB-1 reported a 10% prevalence of being overweight and 4% of obesity amongst children.

Over-nutrition, in the form of overweight and obesity, is highly prevalent in South African adults, with the overweight and obesity rates being higher amongst women than men. The most recent study, South African National Health and Nutrition Examination Survey-1, reported the overweight and obesity prevalence in children aged 2-5 year old as 18.9% and 4.9% respectively for girls and 17.5% and 4.4% respectively for boys in South Africa. In the adult population, being overweight or obese is a vast problem, with the overweight and obesity prevalence respectively at 24.8% and 39.2% amongst women, and 20.1% and 10.6% amongst men.[3]

Micro-nutrient malnutrition is also a problem in South Africa. The NFCS-FB-1 found that only one third of children had an adequate vitamin A status (serum vitamin A > 20µg/dL). Nationally 13.7% of children had a vitamin A concentration of less than 10ug/dL indicating a vitamin A deficiency.[2] In 1999, the NFCS assessed dietary intake and reported that 26% of children 1-3 years old had an energy intake of less than 67% of the recommended dietary allowance. The dietary intake of calcium, iron, zinc, selenium, vitamin A, vitamin D, vitamin C vitamin E, riboflavin niacin, folic acid and vitamin B_6 was found to be more or less 50% of the recommended level for a third of children.[1]

2.2 The concept of malnutrition and the immediate causes: Inadequate dietary intake and/or disease

The United Nations Children's Fund's (UNICEF) malnutrition conceptual framework was developed as part of the methodology of a new nutrition strategy proposed in 1990.[4] The strategy proposed aimed to improve maternal and child nutrition in the developing

countries, through the reduction of and eventual elimination of malnutrition. Although malnutrition manifests itself at the individual level, the causes may be found at numerous levels – varying from household and community level to regional, national and/or international levels. The causes often present in a number of different sectors at the same time. The UNICEF malnutrition conceptual framework illustrates the multi-dimensional nature of malnutrition and distinguishes between the causes at three levels, namely the immediate, underlying and basic causes. (See Figure.2.1) The immediate causes of malnutrition are inadequate dietary intake and or disease, which are linked. The underlying causes of malnutrition are household food insecurity, inadequate maternal and child care, and poor access to basic health services and an unhealthy environment. The basic causes are inadequate education as well as lack of human, economic and organisational resources due to political and ideological factors influenced economic structures and potential resources.[4] The UNICEF policy review that introduced the conceptual framework includes a comment that inadequate or improper education, particularly of women, is often an underlying cause of malnutrition. Most of the underlying causes result from the uneven distribution of resources in society.[4]

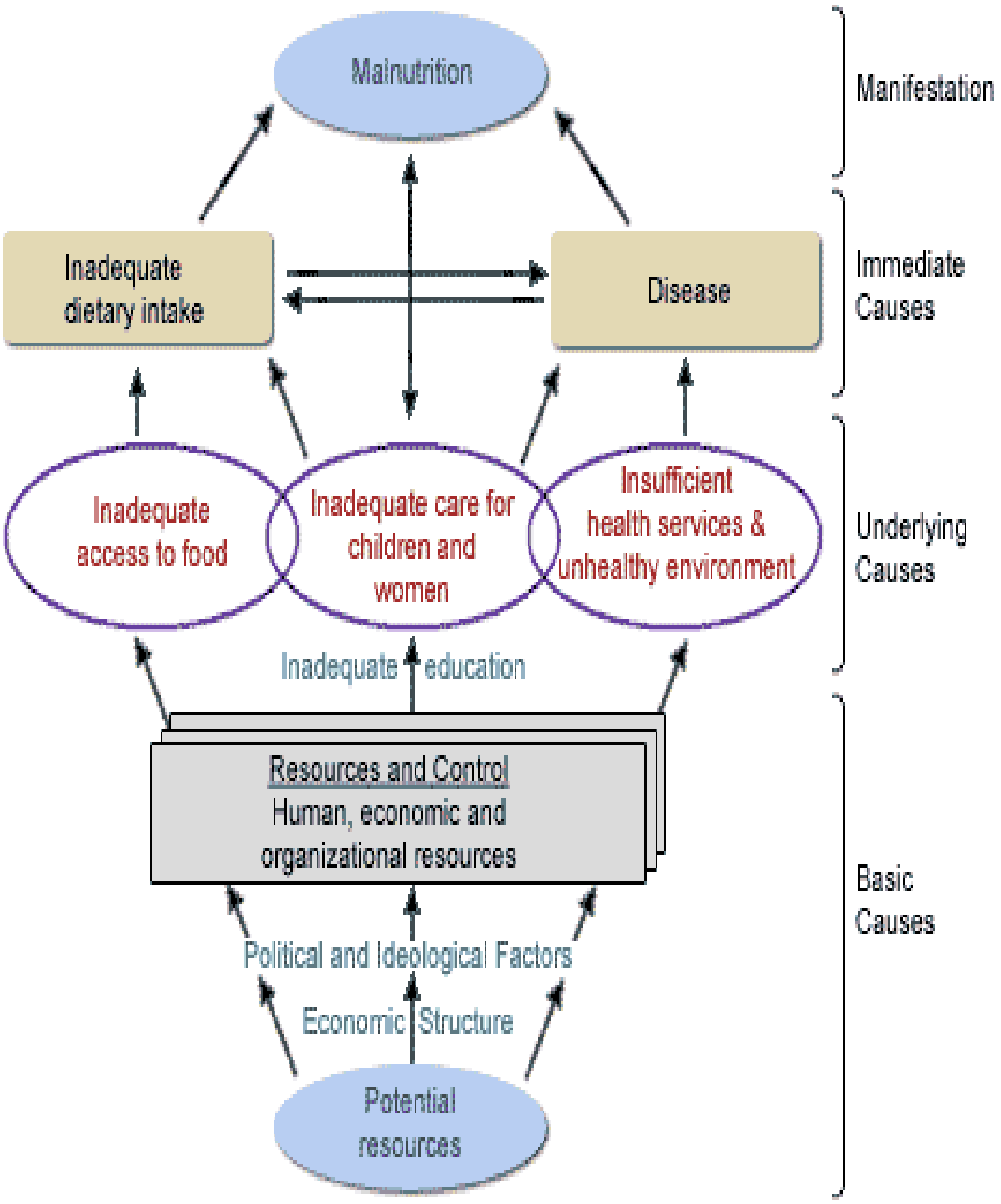

Figure 2.1: The malnutrition conceptual framework[4]

2.3 Anthropometric indicators

Anthropometry is used to describe the health and nutritional status in a population as well as to assess growth and nutritional risk in children. It is a relatively simple, inexpensive, non-invasive method to assess body size and composition. Information such as low birth weight, stunting, wasting, as well as underweight and overweight are attained from simple measurements of height and weight and can indicate inadequate or excessive dietary intake and disease. Furthermore it is important that anthropometric measurements and indicators are used and interpreted correctly in different settings and situations.[5]

Weight-for-age (W/A), height-for-age (H/A) and weight-for-height (W/H) are the indices used most frequently in children to assess nutritional status. Mid-upper arm circumference (MUAC) is often used in children as an additional screening tool, as it is fairly easy to measure.[6]

To compare the anthropometric measurements of children with reference standards is a simple procedure. Before 2006, the World Health Organization (WHO) recommended the use of the US National Center for Health Statistics' (NCHS) reference standards to standardise measurements for age and sex, but presently WHO recommends the use of the 2006 *Child Growth Standards.*[7,8] The indice for each child is calculated using Z-scores, which are defined as the difference between the value for an individual and the median value of the reference population for the same age or height, divided by the standard deviation of the reference population.[6,7]

2.3.1 Underweight in children

The anthropometric indicator W/A reflects body mass relative to chronological age, and is influenced by both the height and the weight of the child. The definition of being underweight is a W/A Z-score (WAZ) equal or less than –2 SD WAZ. A low W/A indicates that a child's weight is low compared to what would be expected for a well-nourished child of the same age and sex.[5] Being underweight can be a sign of both chronic and/or acute malnutrition, but it is not possible to distinguish between the two conditions.[6] The first Millenium Development Goal (MDG) in the United Nations' Millennium Declaration is "to eradicate extreme poverty and hunger" and the reduction of underweight children is one of the recommended indicators to monitor the progress towards achieving this MDG, namely "to halve between 1990 and 2015 the proportion of people who suffer from hunger."[9,10] The right to food is a fundamental human right that needs to be fulfilled globally, including in South Africa.[11,12,13]

2.3.2 Wasting

Wasting is determined using W/H or weight-for-length (W/L). Length is used for children under two years, who cannot stand up well to measure their stature correctly, and therefore their measurement is done in a recumbent position. The term height is the general term used to cover both measurements. The definition of wasting is a W/H Z-score (WHZ) equal or less than –2 SD WHZ. Wasting could be due to failure to gain weight or actual weight loss and reflects current or acute malnutrition. Causes of wasting include inadequate food intake, poor feeding practices, disease and infection, and most often a combination of these factors. Wasting in individuals and populations is very sensitive and can change rapidly with changes in the availability of food e.g. due to seasonal shortages, emergencies, conflict, displacement or due to disease prevalence.[5]

2.3.3 Stunting

Stunting is the term used to describe a low H/A, and is an index of past growth failure and long-term under-nutrition or chronic malnutrition. The definition of stunting is a H/A Z-score (HAZ) of equal or less than –2 SD HAZ.[5] A low H/A could be as a result of retarded foetal growth or when an infant does not reach his or her optimal growth potential due to long-term or chronic factors such as inadequate dietary intake, poor infant feeding practices, regular infections and certain micronutrient deficiencies, particularly iron and zinc.[14] The prevalence of stunting is generally the highest in the poorest parts of society,[14] with the impact of poverty and other associated factors such as inadequate dietary intake, poor hygiene and sanitation, exacerbating the problem of stunting. Stunting in young children is not due to genetic differences, but arises as a result of poor nutrition and infection causing failure to gain weight or weight loss, thus reducing their growth velocity and preventing optimal linear growth.[5]

A systematic review focusing on the impact of under-nutrition and the interventions affecting household food availability and use, maternal and child care and control of infectious diseases, found that under-nutrition in the form of stunting has an irreversible impact on human development. An analysis of the data from the Demographic and Health Surveys of 11 countries showed that there were differences in stunting prevalence between the top and bottom wealth quintiles within a population. Furthermore the review stated that in most countries, the prevalence of stunting was about twice as high amongst poor children than in wealthier children and that poverty affects the intake of animal-source foods, which "are an important component of child diets" since it "is a major source of protein and micronutrients, and low intake of these foods is a risk factor for stunting."[14] Grantham-McGregor et al. identified early childhood stunting and the number of people living in poverty as indicators for poor development at country level.[15]

2.3.4 Mid-upper arm circumference (MUAC)

MUAC, as an index of nutritional status, is valuable to use when it is difficult to do weight and height measurements, for example in emergency situations. MUAC is mostly used for rapid screening of acute malnutrition, but it has been shown in community-based studies to be a good predictor of childhood mortality when compared with height and weight-based anthropometric indicators.[6] MUAC is proposed as an additional screening tool to estimate the prevalence of under-nutrition at the population level or in non-emergency situations.[5] The interpretation of MUAC is done by comparing the measurement with MUAC cut-off values. A cut-off of 11cm is used for screening of severely malnourished children. Generally 12.5cm is used as the cut-off point for

malnutrition, and children with a MUAC below 12.5 cm, with or without oedema, is classified as moderately or severely malnourished.[6]

2.3.5 Overweight in children

Body mass index (BMI) is calculated as the weight (kg)/height^2 (m^2).[5] A WHZ of ≥ 2 SD WHZ[6] or BMI-for-age Z-score (BAZ) of ≥ 2 SD BAZ[8] is used to classify a child as overweight and a WHZ of ≥ 3 SD WHZ or BAZ of ≥ 3 SD BAZ indicates obesity. Overweight and obesity are also forms of malnutrition.[16] The WHO Expert Committee on Physical Status considers a high weight-for-height to be a suitable indicator of obesity at the population level, since most individuals with a high weight-for-height are obese.[6] De Onis et al. used the WHO Child Growth Standards to review the current global levels and patterns of early childhood overweight and obesity. They used W/L and W/H instead of BAZ, but also included BAZ in their comparisons, and their results showed that W/L and W/H and BAZ yielded similar results, suggesting comparability between these indicators for assessing overweight and obesity in preschool-age children. De Onis et al. found the prevalence of overweight and obesity in developed countries is nearly double that in developing countries, but the majority of overweight and obese children live in developing countries due to percentage of the global child population living in these countries. The current WHO definitions of overweight and obesity respectively are the proportion of preschool children with values WHZ >2 SDs and >3 SDs, respectively, from the WHO WH median. For children the risk for being overweight was defined as the proportion with values of >1 SD and ≥ 2 SDs from the median.[16]

2.3.6 Underweight and overweight in adult women

BMI is also used as an indicator to classify underweight and overweight in adults.[5]An adult is described as underweight when he or she has a low body weight relative to height, and it is normally expressed as BMI below 18.5 kg/m^2.[5] The WHO Expert Committee on “Physical status: the use and interpretation of anthropometry”[5] uses three cut-off points for thinness that were proposed by International Dietary Energy Consultancy Group,[17] namely, grade 1: BMI 17.0-18.49 kg/m^2 (mild thinness), grade 2: BMI 16.0-16.99 kg/m^2 (moderate thinness) and grade 3: BMI<16.00 kg/m^2. Overweight and obesity is defined as the degree of fat storage in the body that is associated with increased health risks. The WHO defines a BMI ≥ 25 kg/m^2 as overweight and a BMI ≥ 30 kg/m^2 as obesity.[18] The complete WHO classification of BMI is summarized in Table 2.1.

TABLE 2.1: WHO classification of Body Mass Index (kg/m^2)[6,18,19]

BMI classification	
Underweight	< 18.5 kg/m^2
Normal range	18.5 - 24.9 kg/m^2
Overweight	≥ 25.0 kg/m^2
Pre-obese	25.0 - 29.9 kg/m^2
Obese	≥ 30.0 kg/m^2
Obese class I	30.0 - 34.9 kg/m^2
Obese class II	35.0 - 39.9 kg/m^2
Obese class III	≥ 40 kg/m^2

2.3.7 Co-existence of childhood under-nutrition and maternal overweightness in the same community/household

Childhood growth retardation, especially during the first two years of life, is linked to short adult height and a high risk of certain metabolic disorders and chronic diseases in adulthood when weight gain occurs in later childhood and adolescence.[15,19,20] In the rural Limpopo region of South Africa 31% of underweight children were found to have a mother or caregiver who was overweight with a BMI of 25 kg/m^2 or more.[21] In 2003, Smuts et al. also found the co-existence of stunting in children and overweight and obesity amongst mothers/caregivers in rural districts in the Eastern Cape and KwaZulu-Natal provinces of South Africa.[22]

A secondary analysis of the NFCS data of 1999 showed that stunted children had an increased risk of being overweight in childhood.[23] In the National Income Dynamics Study (NIDS) of 2008, the double burden of child malnutrition and adult obesity was evident within households, with at least one obese adult in 45% of households with a stunted child, as well as an underweight child in 37% of households with at least one obese adult. Overall, the NIDS found that there is both an over-nourished adult and an under-nourished child in one out of every eight South African households.[24]

2.4 The underlying causes of malnutrition

The malnutrition conceptual framework[4] identifies three predominant issues as the underlying causes of malnutrition that require urgent attention, namely; 1) inadequate household food security; 2) inadequate care for children and women; and 3) insufficient health services and an unhealthy environment.[4] An individual's nutritional status is therefore determined by three broad categories, i.e. food, care and health. Adequate nutrition requires the presence of all three of these factors. The role of care is important since it determines the how caregivers feed children and the health of a child through

their use of the health services. Sufficient food intake of children is not only dependant upon household food security but also care-related feeding practices. Care also includes other the factors for example affection psychosocial stimulation, emotional stability consistency and routine that are important for the general development of a child.

2.4.1 The concept of food security and household food security- availability, access, utilisation and stability

The Declaration of the World Food Summit of 2009, states that "food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life."[26;p1] This definition highlights the multidimensional nature of food security, which includes the level and stability of food access and availability, as well as adequacy of food use and nutritional status.[26] Food insecurity exists when people do not have adequate physical, social or economic access to food as defined above.[27]

This definition of food security is more comprehensive than earlier versions, and includes the nutritional dimension, namely the utilisation of sufficient food by every member of a household according to their nutrient needs, and therefore food security is described as having four pillars, i.e. availability, access, utilisation and stability.[26] For infants and young children to achieve food security, it is essential that good caring practices exist in the households where they reside, i.e. good general care and food caring practices, knowledge about health and nutrition, healthy food preparation and eating habits as well as the distribution of food amongst members of a household.

The Declaration of the 2009 World Summit on Food Security included specific commitments and actions, namely the "Five Rome Principles for Sustainable Global Food Security", which focuses on the eradication of hunger from the world. One of these five principles is that a "comprehensive twin-track approach to food security" should be used, including 1) "direct action to immediately tackle hunger for the most vulnerable" and 2) "medium and long-term sustainable agricultural, food security, nutrition and rural development programmes" that address the origin of hunger and poverty. This should include realising the right to adequate food for all.[26]

2.4.1.1 The current situation regarding household food security in SA

The Constitution of South Africa recognises the right to food as a constitutional right of all South Africans and this right is described in articles 27, 28 and 35 of Chapter 2: the Bill of Rights in the South African Constitution.

- Article 27 of the Constitution deals with health care, food, water and social security and Point 1(b) specifically states that "everyone has the right to have access to

sufficient food and water and (1(c)) “social security, including, if they are unable to support themselves and their dependants, appropriate social assistance.”

- Article 27, Point 2 states that “the state must take reasonable legislative and other measures within its available resources, to achieve the progressive realisation of these rights”.
- In Article 28 the rights of children are addressed and point 1(c) states that “every child has the right to basic nutrition, shelter, basic health care and social services”.
- Article 35 deals with the rights of people during detention, and includes their right to nutrition.[28]

In 2002 the South African government adopted an Integrated Food Security Strategy (IFSS), with the vision of food security for all South Africans. The IFSS includes a developmental approach to address food insecurity and includes all relevant sectors of government, the private sector and civil society. The IFSS states that South Africa supports the Plan of Action in the 1996 Rome Declaration on World Food Security. The vision of the IFSS is to achieve universal physical, social and economic access to sufficient, safe and nutritious food by all South Africans at all times to meet their dietary and food preferences for an active and healthy life. The IFFS aims to eliminate the disparities and oppressive poverty prevalent among the majority of households that is manifested by insufficient and unstable food supplies, lack of purchasing power, weak official support networks, poor nutrition, inadequate safety nets, weak food emergency management and unemployment.[13]

The IFSS document mentions South Africa’s food security challenges, namely*:*

1. “to ensure that enough food is available to all, now and in the future;
2. to match incomes of people to prices in order to ensure access to sufficient food for every citizen;
3. to empower citizens to make optimal choices for nutritious and safe food;
4. to ensure that there are adequate food safety nets and food emergency management systems to provide for people who are unable to meet their food needs from their own efforts and mitigate the extreme impact of natural or other disasters on people;
5. to possess adequate and relevant information to ensure analysis, communication, monitoring, evaluation and reporting on the impact of food security programmes on the target population“.[13]

According to the IFSS the increased expenditure since 1994 by the South African government on government social programmes, for example the Primary School Nutrition Programme, now called the National School Nutrition Programme, the Child

Support Grant (CSG), the Expanded Public Works Programme and free primary health care for children, 0-60 months and pregnant and lactating women, forms part of its plan to improve food security conditions.[13]

As a country, South Africa is considered to be food secure, yet many households are food insecure and "the link between poverty, incomes and household food security is not at all clear".[29] Three forms of food insecurity are present in South Africa. Firstly, chronic or long-term food insecurity which is linked to structural deficiency in the food system or the economy, persistent poverty, lack of assets and persistent low incomes. Secondly, transitory food insecurity occurs when a severe lack of food availability or access is experienced due to natural disasters e.g. crop failure, which also leads to loss of income at household level. Thirdly, temporal food insecurity occurs in the form of seasonal food insecurity, when there is a returning pattern of food insecurity, for instance before the harvest period when household supplies are low or where income is periodic since wages are only earned in the harvest period.

Seasonal food insecurity affects poor rural farmers mostly, since they often lack others assets to cope with this recurring problem. The occurrence of seasonal food insecurity is more predictable than transitory food insecurity, but also has a negative impact on household food security in South Africa.[30]

Data regarding food security in South Africa has been measured and reported with different instruments, which prompted Altman et al. to comment that "there is not a specific and accepted measure of food security in South Africa"[29] and therefore, information regarding the extent of household food insecurity is inconsistent. The 2007 General Household Survey (GHS) by Statistics South Africa (StatsSA) included five questions to assess food adequacy and reported that 10.6% of adults and 12.2% of children were "sometimes or always hungry". The five question options included to assess whether respondents experienced hunger because "there was not enough food" ranged were never, seldom, sometimes, often or always hungry.[31] This type of question is based on the respondent's own perception of hunger, and therefore the analysis only gives a broad indication of hunger. The NFCS-FB-1 of 2005 used the Community Childhood Hunger Identification Project (CCHIP) hunger index which comprises a scale of eight questions that indicate whether adults or children in the household are affected by food insecurity, food shortages, perceived food insufficiency or altered food intake due to resource constraints. [32] The NFCS-FB-1 of 2005 found that 51.6% of households experienced hunger and a third of households were at risk of hunger. The family is identified as hungry with the CCHIP when answering affirmatively to five or more of the eight hunger questions. A score of one to four indicates at risk of hunger.[1] The GHS 2007 found that 12.2% of children and 10.6% of adults experienced hunger. The GHS

is a much larger survey than the NFCS-FB-1 and the methods used to assess hunger were different, but both show that the problem of hunger exists in South Africa. According to Jacobs, the data of the NFCS-FB-1 is most likely more accurate than that of the GHS 2007 since the NFCS-FB-1 included food quality, nutrient intake and anthropometric data for the children whilst the GHS only has a "limited scale question".[33]

An analysis by Aliber of two StatsSA datasets i.e. the GHS 2007 and the Income and Expenditure Survey (IES), provides insight about household-level food security in South Africa and found that 51% of households who reported that they had "often" or "always" felt hunger, are most probably eligible to receive a grant.[34] The GHS of 2010 found that more than 21.9% of South African households had inadequate or severely inadequate access to food, based on the results of the Household Food Insecurity Access Scale (HFIAS).[35] The prevalence of hunger reported by SANHANES-1 in 2013 is 26.0%, and thus the SANHANES-1 study shows that the number of households experiencing hunger has halved since the 1999 NFCS and 2005 NFCS-FB-1.[1]

According to the NFCS-FB-1, families at risk of hunger or those experiencing hunger were mostly living in informal housing, had the lowest monthly income, the lowest weekly expenditure on food and the lowest level of education. The latter could have a direct influence on their ability to move out of poverty and become food secure. The NFCS-FB-1 recommended the development of social security programmes that incorporate development approaches and that targets female headed households. The NFCS-FB-1 also recommended the expansion of nutrition education and nutrition campaigns to increase consumer awareness regarding adequate micronutrient intake, healthful eating and food choices based on the South African Food-based Dietary Guidelines for nutrition education.[1]

Based on national food supplies, South Africa is classified as a food secure country, however inequality in our society affects households' ability to access food.[29] The GHS and NFCS-FB-1 used different methodologies to measure hunger as an indication of food security, and their results differ regarding the extent of the problem. However, malnutrition, in the form of being underweight, stunted and having micro-nutrient deficiencies, exists in South Africa, indicating that food security at household level is a problem.[1,31] Steyn et al. showed that being stunted is associated with an increased risk of being overweight.[1,24] Crawford et al. showed overweight in women was related to their childhood experience of food insecurity, and found an association between family food insecurity and the overweight status of mothers and their children.[36]

Economic development and the creation of more job opportunities could lead to a decrease in unemployment and an increase in household income, but it is a slow

process providing a medium to long term solution to the problem of household poverty.[37] Labadarios et al. conducted a dietary assessment of adolescents and adults (16 years and older) who participated in the 2009 national South African Social Attitudes Survey. They found that, based on factors associated with dietary diversity scores (DDS), environmental factors, i.e. availability of water, sanitation and electricity within a formal type of house structure, were associated with household food security.[39] Food security is a complex issue with a multidimensional nature, and all the influencing factors should be included in its measurement to facilitate the setting of realistic food security goals and monitoring systems.

Food security is closely related to all the developmental demands in South Africa, i.e. social protection, sources of income, rural and urban development, health, and access to land, education and nutritional knowledge. The fact that the various factors that influence access to food are not well understood has had negative consequences on government's ability to develop suitable strategies to improve this access.[14]

2.4.1.2 Diet diversity as an indicator of food security and nutrient adequacy of the diet

The obtaining of dietary data to measure household food insecurity, for instance 24-hour recall data to determine energy intake is expensive, time consuming and requires specific technical skills in data collection and analysis. In 2007 the FAO proposed that dietary diversity is a qualitative measure of food utilization that mirrors an individual's access to a wide variety of foods, and is a proxy of the nutrient adequacy of an individual's diet.[39] Hoddinot and Yohannes[40] found a strong association between dietary diversity, measured by the number of individual foods consumed in a household and the per capita household food consumption, calculated by dividing the total household consumption with the number of household members. They concluded that dietary diversity reflects a household's economic ability to acquire a variety of foods and can be used as a proxy for the access dimension of household food security.[40] Both Steyn et al.[41] and Faber et al.[42] found a relationship between dietary diversity and child growth for children in South Africa, where households with at least one stunted child had lower diet diversity scores.

Using the NFCS data for 1 to 9-year old children, Steyn et al. report that the dietary diversity score (DDS) is a promising simple measure that could be used to rapidly assess the nutrient adequacy of an individual's diet, where a DDS of less than 4 reflects poor nutrient adequacy.[41] Faber et al. evaluated household dietary diversity in relation to the living standards measure, months of food shortages and the household food insecurity access scale (HFIAS), and concluded that diet diversity is a promising

indicator of food security and suitable to use in livelihood surveys.[42] Oldewage-Theron and Kruger propose that diet diversity can replace traditional dietary assessment tools for rapid assessment to identify households with the greatest need for assistance.[43]

Labadarios et al. reported dietary diversity for South Africans of all population groups, 16 years and older and found the highest mean diet diversity in urban formal areas, and the lowest in tribal areas. The prevalence of poor dietary diversity was the highest in the Eastern Cape, KwaZulu-Natal, North West and Limpopo provinces and the lowest in the Western Cape. The most commonly eaten foods were cereals/ roots, meat/ fish, dairy and vegetables in the group that are not high in vitamin A. Likewise eggs, legumes and vitamin A-rich fruit and vegetables were the most neglected foods. A DDS below 4 was associated with poor living conditions, such as having no electricity or toilet in the household, or using a river as source of drinking water.[38]

The dietary diversity questionnaire is a rapid, user-friendly and easily administered low-cost assessment tool that can be used to calculate both an individual DDS or a household HDDS.[39] The calculation of the score for an individual or the household level differs and the meanings of the (household and individual) scores differ. The household DDS is a reflection of the household's economic ability to consume a variety of foods, whilst the individual DDS captures nutrient adequacy of an individual's diet. The FAO recommends the use of the dietary diversity tool to assist in our understanding whether and how diets are diversified. Furthermore, it can assess whether households or individuals consume foods of specific interest, i.e. vitamin A-rich vegetables and fruit. The diet diversity questionnaire is standardised tool and was developed to have universal applicability, but it is necessary to adapt it to a specific country or region's local context by including the examples of vegetables and fruit that are available in the area in the different food groups.[39]

2.4.1.3 The household food insecurity access scale for measurement of household food access

The measurement of food insecurity has been challenging for many years because of the multi-dimensional factors causing this phenomenon. The HFIAS was developed by the Academy for Educational Development for the Food and Nutritional Technical Assistance (FANTA) Project of the United States Agency for International Development (USAID) to be used to measure household food insecurity in a valid and easy, yet comprehensive manner.[44]

The HFIAS is a tool that measures a household's food security status in terms of access to food in the past month, by asking nine questions about the adaptations that were made in food intake due to limited resources, as reported by the households

themselves. The HFIAS is a validated tool, and has been used in different settings to estimate the prevalence of food insecurity at household level.[45]

Information collected with the HFIAS tool describes the prevalence of household food insecurity in a community, and distinguishes the food secure from the food insecure households. The HFIAS can also be used to detect changes in household food insecurity over time, thus it is suitable for monitoring and evaluation of food insecurity at household level and in populations. The completion of the HFIAS is non-invasive since all questions are specific to aspects of food consumption. The questions in the HFIAS represent universal domains of the household food insecurity (access) experience and can be used to place households and populations along a continuum of severity, from food secure to severely food insecure.[45]

Faber et al. found in a study in Limpopo that households with higher HFIAS scores had a lower DDS, demonstrating an association between food insecurity and low dietary diversity.[42] Oketch et al. used the HFIAS in KwaZulu-Natal when assessing the nutritional status and quality of life of HIV-positive adults receiving nutrition care and support, and those who are not, and found that 70% of the total study population were food insecure.[46] The African Food Security Urban Network (AFSUN) used the HFIAS in the Urban Food Security Survey in a number of African cities. In Cape Town, 80% of households in the poor communities and areas of the city were shown to be moderately or severely food insecure and household dietary diversity, assessed using the household DDS was also poor.[47]

2.4.2 Adequate care for children and women

Care includes caregiving behaviour such as breastfeeding and complementary feeding practices, food and personal hygiene, diagnosing illnesses, stimulating language and other cognitive capabilities, and providing emotional support.[26]

In the context of food and nutrition security care refers to the provision, of time, attention and support to meet the physical, mental and social needs of the growing child and other family members in the household and the community. Good or adequate care of infants and young children is affected by the circumstances in the household and the position of women. A mother's knowledge regarding child care and her access to and ability to control the necessary resources, including income, generally determines the extent and quality of the care she is able to provide for her children and herself, thus eucation plays a particularly important role in determining how resources are utilized to secure food, health, and care for children. Lack of resources, in the form of time, knowledge and income, as well as the subordinate position of women in many societies are underlying and basic causes of malnutrition. The establishment of community-

based childcare arrangements, income-generating activities for women and the training and education of families should all aim to empower women with the skills and knowledge required to create circumstances where enhanced care for themselves and their children is possible. Care should not be the responsibility of women and mothers solely, but of both parents.[4,26,48]

Important issues specifically related to maternal and child nutrition are breastfeeding and infant care, complementary feeding practices including the energy density of foods, food quality and safety and feeding frequency, amongst others. To achieve adequate care for children and caregivers, health and nutrition education, a supportive environment as well as direct interventions to improve women's health and nutrition are necessary.[53] Investment in interventions aimed at achieving optimal nutrition and physical growth, including mental development, in children has been proven to not only decrease the prevalence of stunting but also to prevent its negative functional consequences throughout the life cycle. It is very important that policy-makers focus their attention on the nutritional status of children as one of the main indicators of development and as a precondition for the long term socioeconomic advancement of societies.[48,49]

2.4.2 Access to health care services and healthy environment

Free primary health care (PHC), as described in detail in the Alma Ata Declaration of 1978,[50] was implemented in South Africa in 1994 by the new democratic government. The first two policies that were introduced by the South African Government were: “Free healthcare for pregnant mothers and children under the age of six years” and the “Universal access to primary healthcare for all South Africans”. These policies give “special emphasis to the development of clinics and basic health care programmes such as safe motherhood, child health and nutrition, expanded immunisation, management of communicable disease and the treatment of chronic ailments”.[51]

The South African Department of Health Integrated Nutrition Programme (INP) recently released its revised strategy, the Roadmap for Nutrition in South Africa, 2012-2016.[52] The vision of the INP is “optimal nutrition for all people in South Africa” and the mission is “to provide caring, high quality, evidence-based nutrition services, particularly for women, infants and children, through advocacy, health promotion and integrated health care, and thus to improve the nutritional status, reduce morbidity and mortality, and increase life expectancy with improved quality of life for all people in South Africa”.[52] The key nutrition interventions of Department of Health, as detailed in the INP Roadmap 2012- 2016 and the Strategic Plan for Maternal, Newborn, Child and Women’s Health (MNCWH) and Nutrition in South Africa, 2012- 2016,[53] are aligned with

the actions proposed by the Scaling up Nutrition Framework,[54] by Bhutta et al. in the 2008 Lancet Series paper, Maternal and Child Undernutrition: Interventions for maternal and child undernutrition and survival[55] and the Tracking Progress on Child and Maternal Nutrition Review.[48] The Roadmap explicitly points out the need to focus on the life-cycle stages before and during pregnancy, and in the first two years of life.[52] Optimal nutrition during this period lays the foundation for a long and healthy life and reduces the risk of developing diet-related chronic diseases. The first thousand days (from gestation to 24 months) is recognised globally as the 'window of opportunity' for direct nutrition interventions.[19,55]

The INP targets at-risk pregnant and lactating women and children under five years old, with specific focus on those who are nutritionally vulnerable. Within the PHC sector and facilities there are a number of nutrition intervention programmes that form part of the INP's Health Facility-based Nutrition Programme. These programmes are the Mother Baby Friendly Initiative, Nutrition Therapeutic programme, the Road to Heath chart or booklet, which includes growth monitoring and promotion, and the Vitamin A supplementation programme.[52]

The implematation of the Baby Friendly Hospital Initiative and the establishment of more baby-friendly hospitals as well as the promotion, support and protection of breastfeeding has been an important priority of the INP since 1994. By 2010, 42% of all maternity facilities in South Africa had achieved baby-friendly status.[52] South Africa has high breastfeeding initiation rates, but rates of exclusive breastfeeding up to six months and extended breastfeeding up to two years and beyond are very low.[57] South Africa has adopted 2010 WHO Infant Feeding Guidelines recommendations that infants of HIV infected mothers should also be breastfed, unless replacement feeding is acceptable, feasible, affordable, safe and sustainable (AFASS), namely the AFASS criteria are met.[52]

South Africa is dedicated to achieving its MDGs, which will have significant positive implications for the health and well-being of women, mothers and children. The Strategic Plan for MNCWH and Nutrition in South Africa, 2012- 2016,[53] aims to identify priority interventions which are likely to have the biggest impact on reducing maternal, new-born and child mortality and reproductive health.

- The starting point is basic antenatal care for all pregnant women, including four visits to antenatal clinics, beginning during the first trimester. All pregnant women should receive iron and folate supplements during pregnancy, and at least 800 – 1000 µg calcium supplementation per day to prevent pre-eclampsia. The basic antenatal care package includes the promotion of optimal dietary practices during pregnancy.

- The next important intervention is the promotion and support of exclusive breastfeeding up to six month of age for infants, including practice, promotion and support of Kangaroo Mother Care when indicated, as well as appropriate complementary feeding practices for infants and young children.
- Additionally, there is the provision of preventative services including immunisation, growth monitoring and promotion, vitamin A supplementation, regular de-worming, appropriate and correct management of common childhood illnesses using the Integrated Management of Childhood Illnesses case management process.
- Immediate referral to hospitals and optimal hospital management of ill and severe malnutrition, as well as early identification and appropriate management of HIV-infected children are also priority interventions to promote child health.[53]

Bhutta el al identified the inclusion of iron, folate and calcium supplementation as well as maternal supplements of balanced energy and protein during pregnancy, promotion of breastfeeding, behaviour change communication for improved complementary feeding practices, zinc and vitamin A fortification or supplementation, zinc in treatment of diarrhoea, universal salt iodisation, treatment of severe malnutrition as well as hand washing or hygiene interventions as some of effective, evidence-based interventions to address maternal and child undernutrition.[55] These intervention are included in the Strategic Plan for MNCWH and Nutrition in South Africa, 2012-2016.[53]

Recently, five years after the 2008 *Lancet's Series on Maternal and Child Undernutrition*, a comprehensive update[56] re-evaluating the problems of maternal and child under-nutrition, was released. This series included a focus on the growing problems of overweight and obesity in women and children, and their consequences, specifically in low and middle-income countries. An increase in the prevalence of overweight and obesity in women and children is also a problem in South Africa.[1-3,22,23]

The 2013 series introduced a new framework for actions to achieve optimum foetal and child nutrition and development.[56] This framework shows the determinants of optimal growth and development consists of factors functioning at different levels of causation. The new framework includes the role of governance to ensure that the social, economic, political, and environmental situation improves to positively impact health, growth and development where food, disease, and care have a vital role.

The framework mentions the following evidence-based nutrition-specific interventions and programmes that need to be included as responsibilities of health departments:

- adolescent health and preconception nutrition
- maternal dietary supplementation
- micronutrient supplementation or fortification

- breastfeeding and complementary feeding
- dietary supplementation for children
- dietary diversification
- feeding behaviours and stimulation
- treatment of severe acute malnutrition
- disease prevention and management
- nutrition interventions in emergencies.[56]

Nutrition sensitive programmes and approaches to be incorporated by other government departments, including health departments are also listed as:

- social safety nets
- early child development
- maternal mental health
- women's empowerment
- child protection
- classroom education
- water and sanitation
- health and family planning services.[56]

In South Africa, different governmental departments are structured in clusters according to the specific strategic challenges and the Social Sector Cluster includes, amongst others, the departments of agriculture, health, education, human settlements, social development, arts and culture. The social sector is responsible for programmes that address poverty alleviation and eradication, the delivery of water and sanitation, social security services, delivery of comprehensive health care, integration of human settlements, youth development and free basic services. All the nutrition-sensitive programmes proposed by Black et al.[58] are included in the responsibility of the Social Sector Cluster of the South African government.

A healthy environment is a vital prerequisite for optimal health and includes ready access to water and good environmental sanitation and the absence there-of are underlying causes of malnutrition, since these conditions directly affect health, food production and preparation and general hygiene. Inadequate access to piped water also affects nutrition indirectly by increasing the workload of women, thus reducing the time available for the childcare.[2] The Community Survey 2007 showed that the number of South African households that have access to piped water (88.6%) and flush toilets (60.4%) has increased since Census 2001.[59]

2.5 Basic causes of malnutrition

The basic causes of malnutrition are human and environmental resources, economic systems and political and ideological factors.[4] Smith and Haddad stated that poverty is a significant factor that affects all the underlying factors of child malnutrition, and furthermore the underlying determinants and poverty are also influenced by the basic determinants of child malnutrition.[60]

Efficient human resources and sufficient economic and organisational resources are important for the provision of good governance and economic support to ensure the successful implementation of policies and programmes to address the underlying causes of malnutrition. The ineffective use of human, economic and technological resources and challenging environmental conditions are common basic causes of malnutrition. Lack of good governance and insufficient basic infrastructure affect health, education, employment and income, as well as the utilisation of the potential resources and that influences food security, care, health services and the environment. Furthermore, subordination of women in many societies is another important political and basic economic cause.

The 2008 Commission on the Social Determinants of Health (CSDH) Final Report provides guidance to all role players regarding their roles and responsibilities to address the social determinants of health by reducing health inequity in societies. The CSDH report states that social and economic policies have a determining impact whether a child will be able to grow and develop to reach its full potential. The social determinants of health are described as the conditions, in which people are born, grow up, live, work and age, and the systems put in place to deal with illness. The CSDH report states that these conditions are produced by the economic and social policies and politics in a country, and therefore it is the responsibility of governments to give support in tackling the social causes of poor health and avoidable health inequalities.[61]

2.5.1 Income

South Africa is officially classified as an upper-middle income country, when per capita income is considered, but on the other hand there is a large inequality in the distribution of income, assets and opportunities, which has its roots in the pre-1994 apartheid policies. Pauw and Mncube reported that in 2000 more than 55% of South Africans lived in the poorest 40% of households, and this figure increased since 1995, thus inequality related to income worsened during the period 1995 to 2000.[62]

Chitiga et al. reported that during the international economic crisis in 2008 employment decreased and unemployment rates increased.[63] The consequences of a decrease in employment is a reduction in household and per capita income. Sufficient per capita

income in a household is one of the most important prerequisites to ensure household food security. The ability of households to access food is dependent upon a source of income, to enable them to buy food at retailers, vendors and markets.

According to the StatsSA's annual GHS of 2010, 62.4% of households are dependent on incomes from salaries and 44.9% on grants, but remittances as a source of income also play a significant role in most provinces, especially in the poorer provinces, i.e. Limpopo, Eastern Cape and Mpumalanga.[35]

2.5.2 Poverty

Nutritional status is influenced by three broad categories – food, care and health – and adequate nutrition requires the presence of all three. Furthermore, all three of these factors are strongly influenced by poverty. Poverty causes poor living conditions, lack of resources and household food insecurity and thus families are unable to care sufficiently for their children causing growth faltering, wasting and/or stunting depending on the period of insufficient food intake and poor health.[4,64]

In 2000 the United Nations organised the Millennium Summit where the realities and problems that existed globally were discussed by leaders. The result was the drafting of the United Nations Millennium Declaration with eight MDGs and eighteen specific targets.[65] South Africa is also a signatory of the Millennium Declaration.[66] MDG 1 is to "eradicate extreme poverty and hunger".[9] In 2007-2008 the UNICEF-led Global Study on Child Poverty and Disparities was carried out in 40 countries across the world as the persistence of poverty was identified as one the causes of the slow progress towards achieving the MDGs. The purpose of this study was to provide evidence of how poverty and disparities impact children. Furthermore Global Study on Child Poverty and Disparities aimed to develop guidance concerning analysis, policy and partnerships to promote gender equality and deliver results for all children by strengthening the profile of children in national policies by advocating for children's rights.[67] The Children's Institute at the University of Cape Town monitors the South African government and civil society's progress towards realising the rights of children and pruduces an annual document the Child Gauge which documents the situation of children in South Africa and progress towards reaching the targets set to achieve MDGs.[64]

In South Africa the position of children was strengthened with two relatively new acts, namely the Children's Act (No 38 of 2005), passed in 2005, and the Children's Amendment Act (No 41 of 2007). These acts give effect to children's constitutional rights in the Bill of Rights, and include the right to family care or alternative care, social services, and protection from abuse and neglect.[68] Section 27(1)(c) of the South African Constitution recognises the right of all persons to have access to social security and

appropriate social assistance if they are unable to support themselves and their dependents. Furthermore, the state is obliged to ensure that all children in need, including children living in child-headed households, are supported through access to social grants.[28] Several studies have shown that the South African Department of Social Development's Social Assistance programme that issues grants to poor people is the most important poverty alleviation programme in South Africa.[62,63,69-72]

Armstrong et al.[72] found that certain groups in South Africa experience poverty more intensely than others. These are black people, female-headed households, the aged, less educated individuals, the unemployed and the inhabitants of rural areas, specifically in KwaZulu-Natal, Limpopo and the Eastern Cape. They report that income poverty is inseparably linked with other dimensions of deprivation, for example access to important basic services namely schools and clinics, public service departments and social grants to assist in alleviating extreme poverty.[72] The measurement of poverty is challenging since for example sometimes families live in decent homes, have adequate assets to protect them from vulnerability and resources to maintain a decent living standard, and therefore they are able to spend more of the grant money on food, and are able to survive on a smaller household income than some other families. Furthermore, it is also difficult to validate the information on income that people disclose. Participants sometimes do not know the precise value of the total income of the household or the full income of their spouse for different reasons.

Filmer and Pritchard devised and validated a method for estimating household economic status in the absence of income and expenditures information, which can be utilised to quantify differences in socio-economic status. Their "asset index" is constructed by using information regarding the assets owned by households, which they named household asset variables to create an index of assets that is a proxy for household economic status. It is important that the variables included are ones that are important for health, such as education, water and sanitation, employment, living or housing conditions, nutrition and social security. The statistical method of principle components analysis is used to determine weights for an index of the asset variables, and factor and principle analysis is employed to measure the differences in socio-economic status.[73] This method was also been used by StatsSA to describe poverty.[74] The asset index is also suitable to use as control indication for household economic status.[73]

As mentioned above the measurement of poverty is a complex issue, which has also often been investigated and debated within South Africa in the past, but an official poverty measure has not yet been adopted. Mattes developed and tested the Lived Poverty Index (LPI) in cross-national surveys and concluded that it is an effective,

simple, reliable and valid tool. The LPI has six questions that enquire about people's lived experiences of poverty by asking respondents' abouth their access to daily living basic necessities in the past twelve months. The LPI is a subjective measure of poverty, is easily administered without enquiring about household income, assets, expenditure or access to services and produces an individual level measure of poverty. Mattes and his co-workers used the LPI extensively in the Afrobarometer surveys, a series of annual surveys, in many African countries and Frayne et al. used the LPI in the African Food Security Urban Network (AFSUN) surveys.[75,76] The LPI questions enquire how often, if ever the participant and his family had gone without the six vital resources for daily living with six options, ranging from never to always, including "don't know" as option. The repondents are required to reflect and respond to their situation as experienced in the past twelve months. The LPI index score ranges from 0 for no lived poverty to 4 for complete lived poverty. In the CNSP the LPI questions were asked regarding respondents experience over the past month. Households were asked how often they have gone without: (a) enough food to eat, (b) enough clean water for home use, (c) medicine or medical treatment, (d) electricity for their home, (e) enough fuel to cook their food, and (f) a cash income in past month.

2.5.3 Social security: the Child Support Grant

According to information obtained from the official website of the Department of Social Development (DSD) the purpose of the DSD's comprehensive social security programme is: "To alleviate and reduce poverty, vulnerability, social exclusion and inequality through a comprehensive social protection system".[77] The social security grants paid monthly by the DSD are the Foster Care Grant (FCG), Care Dependency Grants, War Veterans Grants, the Old Age Grant for people older than sixty years of age, the Disability Grant (DG) for people who are not able to work due to disability and the Child Support Grant (CSG).[78]

The monetary value of the CSG was R100 when it was introduced in 1998 and initially it was only issued to children under the age of 7 years, living in poverty, but currently the CSG is paid for children up to the age of 18 years.[79]At present (the year 2012 to 2013) the monetary value of the CSG is R300.00 per month.[78] Grants are also referred to as unconditional cash transfers that are given to families with children living in poverty to enable them to improve their nutrition, health and education. The term unconditional means that there is no specific requirement that recipients need to comply with, whilst a conditional grants indicates recipients are required to comply with certain conditions for example to attend a clinic a specified number of times per year. Recipients of the CSG in South Africa are not required to do anything in return and are not told how they

should spend the grant money once they have qualified for the CSG.[79] In South Africa grants are administered by the South African Social Security Agency (SASSA). To qualify for social assistance SASSA uses a means test which entails an evaluation of the income and assets of the person applying in order to decide whether the person's means are below a stipulated amount. This procedure is followed is to determine whether a person qualifies to receive a grant, as grants are indeed meant for those who have insufficient means to support themselves. The asset and income threshold differs for the different grants issued by SASSA.[78] The number of CSG's issued in South Africa is by far the largest when compared with the DG, FCG, Care ||Dependency Grant, War Veterans Grant and the Old Age Grant, but the monetary value of this grant is about a fifth of that of the other grants. Since 1998 the monetary value of the grant and the cut-off age for children eligible for the CSG has changed a number of times. Agüero et al. stated in 2007 that the cost of living has increased substantially since 1998, but the means test threshold had remained the same.[70]

A 2003 review by Wolaard of three child grants (CSG, FCG and Care Dependency Grant) and the Old Age and Disability Grant in South Africa, five years after the implementation of the CSG in 1998, reported that the grants are well-targeted, since the poorest 20% of households are benefitting the most from receiving grants. Woolard concluded that social assistance grants play a large role in redistribution of wealth and poverty reduction in South Africa, by reducing the number of individuals living in poverty from 40% to 24%, and by reducing the Gini coefficient, an indicator of inequality, from 0,67 before grants to 0,62 after grants.[81]

The South African Child Gauge 2009/2010 reported that more than 9 million children were receiving the CSG by July 2009 and estimated that 71% of children eligible to receive the CSG, were accessing the CSG.[65]

A 2008 review of the CSG reported that the CSG is successful in targeting poor households and mentions that the CSG is government's largest social assistance programme considering the amount of beneficiaries reached, and therefore it is South Africa's main poverty alleviation strategy targeting children. This report mentioned that CSG recipients were less likely to have access to basic services such as running water or a toilet inside their home. Access to these basic services was lower in rural or informal areas, indicating that the current differentiation between types of areas in the means test is justified. A greater number of eligible caregivers who are receiving the CSG live in rural or informal areas, than do in formal urban areas. The size of households with respondents who are CSG recipients tended to be larger than that of households not receiving it, in spite of the latter being eligible to receive a CSG. Nearly all the primary caregivers were female. The recipients of the CSG were inclined to have

lower education levels, which in turn lead to fewer employment opportunities or access to income generation activities than those not entitled to receive a CSG. Beneficiaries of the CSG were most likely to live with their biological mother only than with their fathers only, or with both, otherwise they lived with neither of their parents. Households in this 2008 review had low levels of monthly income, and the income levels were lower in rural or informal urban areas than formal urban areas. In households where the income was inadequate it was found that any grant money coming into the household, including the CSG, was likely to be pooled to cover household expenses instead of being spent exclusively to sustain the targeted child. In this study, just over half of the recipients (51%) reported pooling the grant money with other household income, and this is possibly an under-estimate as recipients were conscious that the grant is supposed to be used for the targeted child. This type of practice dilutes the benefits of the CSG for the targeted child and could be less of a problem after the extension of the age limit of the CSG to include children up to 18 years old. Generally the CSG accounted for 40% of reported household income and a high degree of dependence on the CSG was evident, since the primary caregivers had very low personal incomes. According to this report the CSG supports many households affected by the problem of unemployment and inadequate opportunities for economic development.[82]

Agüero et al. performed an extensive review of the uses and implementation of the CSG and using height-for-age Z-scores as indicator of the nutritional input that children under three years old had received, showed that the CSG promoted early childhood nutrition, as indicated by the significantly better growth in the group of children who received the CSG compared to those not receiving the grant.[70] An economic analysis by Coetzee in 2011 also found that some of the cash that caregivers receive via the CSG appears to be spent on improving the welfare of children, thus having a positive impact on their health, nutrition and education.[79] Agüero et al. mention that it appears as if the increased income assigned to women in the case of CSG payments did directly benefit child poverty and nutrition, but admits that it is impossible to say whether the CSG would also have a longer term impact, referring to the ability to alleviate the inter-generational effect of poverty.[70] Black et al. stated in their 2008 Lancet Series paper that undernourished children are more prone to become short adults, have poorer learning achievement, as parents have smaller babies and have a poorer economic ability in adulthood.[14]

One of the key messages of the South Africa Health Review 2008, concerning nutrition from a PHC perspective, is that capacity development of health workers, including community-based health workers, should include nutrition promotion to strengthen community-based interventions and other safety nets that impact on nutrition, such as

the CSG and early childhood development.[83] The strengthening of nutrition promotion could advance the long term benefits of the CSG, since good nutrition for infants and pre-school children would benefit their health, growth and development and enable them to progress well at school and thereafter benefit from socio-economic development opportunities.

An estimation of the reduction in hunger and impact of the CSG on school attendance among children between 2002 and 2004, illustrated a significantly bigger reduction in hunger and improvement in school attendance for CSG recipients compared to non-recipients of the CSG.[84] In-depth analysis of General Household Survey data collected in 2003 and 2007 looked at the impact of CSG on other outcomes, i.e. changes in child labour, specifically time spent by children to fetch water and fuel; changes in household employment rates referring to members in the household old enough to work, who are working and whether there was an increase in using social workers by household members. Furthermore the analysis measured whether there were changes in the farming activities of the household and cell phone availability in the household was also included, but for none of these outcomes a statistically significant impact of CSG was found.[84]

A search of the literature regarding the CSG shows that many studies[62-64,69-72,79,81,84-86] have assessed the implementation and socio-economic impact of the CSG, as well as the impact on nutritional status and health of children receiving a CSG. The most recent survey about the CSG included five provinces and collected data on adolescents and their households. The survey reported that more than 10 million South Africa children receive the CSG monthly. One of the survey questions gauged whether early versus late enrolment affected the well-being and development of children. This questionnaire included anthropometric status, health and schooling of the children and their access and use of preventative health and nutrition care. The results showed that the CSG had a positive developmental impact, which was evident in the nutritional, educational and health outcomes measured. This survey showed that early receipt of the CSG had a positive developmental impact and that the CSG reduces the impact of poverty, promotes improved gender outcomes and reduces inequality.[86]

There is a paucity of studies reporting the diet quality of recipients and whether the CSG actually improves the nutrition security of children receiving the CSG. A 2008 UNICEF review regarding the uses and implemementation of the CSG and obstacles experienced, stated that the purpose of the CSG is to enable families to improve their ability to care for their basic needs.[84]The South African government offers free PHC and free education from grade one to nine, thus it is reasonable to argue that the grant

should primarily be used for food, clothing and housing, and thus should not only prevent children from experiencing hunger, but also improve their nutrition security.

2.6 REFERENCES

1. Labadarios D, Editor. (2007) The National Food Consumption Survey: Fortification Baseline (NFCS-FB-1), Stellenbosch, South Africa.
2. Shisana O, Labadarios D, Rehle T, et al & SANHANES-1 Team. (2013) South African National Health and Nutrition Examination Survey (SANHANES-1). Cape Town: HSRC Press. [Online]http://www.hsrc.ac.za/en/media-briefs/population-health/results-sanhanes1 [2013, 1 September]
3. Labadarios D, Steyn NP, Maunder E, et al. The National Food Consumption Survey, South Africa. (1999) Public Health Nutrition 2005;8(5):533-543 [Online] doi:10.1079/PHN2005816 [2013, 1 September]
4. UNICEF. (1990) Strategy for Improved Nutrition of Children and Women in Developing Countries. New York: UNICEF [Online] http://www.ceecis.org/iodine/01_global/01_pl/01_01_other_1992_unicef.pdf [2013, 3 November]
5. Physical status: the use and interpretation of anthropometry. (1995) Report of WHO Expert Committee. Technical Report Series No. 854. [Online] http://whqlibdoc.who.int/trs/WHO_TRS_854.pdf [2012, 30 August]
6. Cogill B. (2003) Anthropometric Indicators Measurement Guide. Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington, D.C., Revised Edition. [Online] http://www.fantaproject.org/publications/anthropom.shtml [2013, 1 September]
7. Garza, C, de Onis, M. Introduction. The Journal of Nutrition 2007;137(1):142–143 [Online] http://jn.nutrition.org/content/137/1/142.full [2013, 17 June]
8. Duggan MB. Anthropometry as a tool for measuring malnutrition: impact of the new WHO growth standards and reference. Annals of Tropical Paediatrics 2010;30:1–17. [Online] www.ncbi.nlm.nih.gov/pubmed/20196929 [2012, 1 September]
9. United Nations Development Programme- Millennium Development Goals. [Online] http://www.undp.org/content/undp/en/home/mdgoverview.html [2013,10 September]
10. Food and Agriculture Organization, World Food Summit. (1996) [Online] http://www.fao.org/docrep/x2051e/x2051e00.HTM#P283_30407? [2013, 11 August]
11. United Nations. (2000) United Nations Millennium Declaration (doc: A/RES/55/20) [Online] http://www.un.org/documents/instruments/docs_en.asp [2013. 10 September]

12. United Nations. (1999) Economic and Social Council. General Comment 12 .The right to adequate food (art. 11) [Online] http://www.fao.org/fileadmin/templates/righttofood/documents/RTF_publications/EN/General_Comment_12_EN.pdf [2013. 10 September]
13. Department of Agriculture, South Africa. (2002) The Integrated Food Security Strategy for South Africa. [Online] Available: http://www.sarpn.org/documents/d0000497/index.php [2013, 10 September]
14. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet 2008;371:243–260 http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616900 [2013, 13 September]
15. Grantham-McGregor S, Cheung YB, Cueto S, et al. Developmental potential in the first 5 years for children in developing countries. Lancet 2007;369:60-70 [Online] Available: http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607600324 [2013, 19 October]
16. De Onis M, Blössner, Borghi E. Global prevalence and trends of overweight and obesity among preschool children. American Journal of Clinical Nutrition 2010;92:1257–1264 [Online] http://ajcn.nutrition.org/content/92/5/1257.full.pdf+html [2013, 10 September]
17. Obesity: preventing and managing the global epidemic. WHO Consultation on Obesity. (1999) WHO technical report series; 894. [Online] http://www.fao.org/docrep/t1970e/t1970e00.htm [2013, 10 September]
18. Shetty PS, James WPT. (1994) Body mass index - A measure of chronic energy deficiency in adults. FAO Food and Nutrition Paper 56. Food and Agriculture Organization of the United Nations, Rome, 1994. [Online] http://www.fao.org/docrep/t1970e/t1970e00.htm [2013, 10 September]
19. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. Lancet 2008;371:340–357 [Online] Available: http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616924 [2012, 23 July]
20. Dewey KG, Begum K. Long-term consequences of stunting in early life. Maternal and Child Nutrition 2011;7(Suppl.3):5–18 [Online] http://onlinelibrary.wiley.com.ez.sun.ac.za/doi/10.1111/j.1740-8709.2011.00349.x/pdf [2012, 17 September]
21. Steyn NP, Nel JH, Tichelaar HY, et al. Malnutrition in Pedi preschool children, their siblings and caretakers. South African Journal of Clinical Nutrition 1994;7:12–18

22. Smuts CM, Faber M, Schoeman SE, et al. Socio-demographic profiles and anthropometric status of 0- to 71-month-old children and their caregivers in rural districts of the Eastern Cape and KwaZulu-Natal provinces of South Africa. South African Journal of Clinical Nutrition 2008;21:117-124 [Online] http://www.ajol.info/index.php/sajcn/article/view/34790/38479 [2012, 16 September]
23. Steyn NP, Labadarios D, Maunder E, et al. Secondary anthropometric data analysis of the national food consumption survey in South Africa: The double burden. Nutrition 2005;21:4-13 [Online] http://www.sciencedirect.com.ez.sun.ac.za/science/journal/08999007/21/1 [2013, 19 October]
24. Ardington C, Case A. (2009) Health: Analysis of the NIDS Wave 1 dataset. NIDS Discussion paper 2. [Online] http://www.nids.uct.ac.za/documents/discussion-papers/93-nids-discussion-paper-no02 [2013, 3 September]
25. Engle PL, Menon P, Haddad L. (1997) Care and nutrition: concepts and measurement. International Food Policy Research Institute Washington, D.C. [Online] http://www.ifpri.org/sites/default/files/publications/oc33.pdf [2014, 25 Januarie]
26. Declaration of the World Summit on Food Security. Rome, 16-18 November 2009. [Online] Available: http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf [2013, 11 September]
27. High-level task force on the global food security crisis. Updated comprehensive framework for action. (2010) [Online] http://un-foodsecurity.org/sites/default/files/UCFA_English.pdf [2013, 19 October]
28. The Constitution of the Republic of South Africa, 1996. (Act 108 of 1996) [Online] http://www.info.gov.za/documents/constitution/1996/96cons2.htm#35 [2011, 10 September]
29. Altman M, Hart TGB, Jacobs PT. Household food security in South Africa. Agrekon 2009;48:345-361
30. Hart TGB. Exploring definitions of food security and vulnerability: time to refocus assessments. Agrekon 2009;48:362-383
31. General Household Survey 2007, Statistics South Africa. (10 July 2008) [Online] http://www.statssa.gov.za/publications/statsdownload.asp?PPN=P0318&SCH=4187 [2011, 10 September]
32. Wehler CA, Scott RI, Anderson JJ. The community childhood hunger identification project: A model of domestic hunger—Demonstration project in Seattle, Washington. Journal of Nutrition Education 1992; 24 (1) 29S-35S [Online]

http://www.sciencedirect.com/science/article/pii/S002231821280135X [2014, 26 February]

33. Jacobs PT. The status of household food security targets in South Africa. Agrekon 2009;48:410-433
34. Aliber M. Exploring Statistics South Africa's national household surveys as sources about household-level food security. Agrekon 2009;48:384-409
35. General Household Survey, July 2010. [Online] http://www.statssa.gov.za/publications/P0318/P0318June2010.pdf [2012, 20 October]
36. Crawford PB, Townsend MS, Metz DL, et al. How can Californians be overweight and hungry? California Agriculture *2004;*58:12-17 [Online] http://escholarship.org/uc/item/9mn8z8p7 [2013, 24 May]
37. De Klerk M, Drimie S, Aliber M, et al. (2004) Food security in South Africa: Key policy issues for the medium term. Human Science Research Council, Integrated Rural and Regional Development. [Online] www.hsrc.ac.za/en/research-outputs/ktree-doc/1199 [2013, 19 October]
38. Labadarios D, Steyn NP, Nel J. How diverse is the diet of adult South Africans? Nutrition Journal 2011;10:33 [Online] http://www.nutritionj.com.ez.sun.ac.za/content/10/1/33 [2013, 19 October]
39. Kennedy G, Ballard T, Dop MC. (2011) Guidelines for measuring household and individual dietary diversity. Nutrition and Consumer Protection Division, Food and Agriculture rganization of the United Nations [Online] http://www.fao.org/docrep/014/i1983e/i1983e00. [2013, 19 October]
40. Hoddinott, J, Yohannes Y. (2002) Dietary Diversity as a Household Food Security Indicator. Washington, D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development. Dietary diversity as a food security indicator. [Online] http://www.fantaproject.org/sites/default/files/resources/DietaryDiversity-HH-FS-Indicator-2002.pdf [2013, 19 October]
41. Steyn NP, Nel JH, Nantel G, Kennedy G, Labadarios D. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? Public Health Nutrition 2006;9(5):644–650 [online] http://www.ncbi.nlm.nih.gov/pubmed/16923296 [2013, 19 October]
42. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household security indicators. International Journal of Food Safety, Nutrition and Public Health 2009;2(1):1-15

43. Oldewage-Theron W, Kruger R. Dietary diversity and adequacy of women caregivers in a peri-urban informal settlement in South Africa. Nutrition 2011;27(4): 420-427 [Online] http://www.sciencedirect.com.ez.sun.ac.za/science/journal/08999007/27/4 [2013, 19 October]
44. Webb P, Coates J, Frongillo EA, et al. Measuring household food insecurity: Why it's so important and yet so difficult to do. The Journal of Nutrition 2006;136:1404S-1408S [Online] http://jn.nutrition.org/content/136/5/1404S.full.pdf+html?sid=13cd2135-84ed-4281-92ec-45fb46d1fe69 [2013, 19 October]
45. Coates J, Swindale A, Bilinsky P. (2007) Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development. [Online] http://www.fao.org/fileadmin/user_upload/eufao-fsi4dm/doc-training/hfias.pdf [2013, 19 October]
46. Oketch JA, Paterson M, Maunder EW, et al. Too little, too late: Comparison of nutritional status and quality of life of nutrition care and support recipient and non-recipients among HIV-positive adults in KwaZulu-Natal, South Africa. Health Policy 2011;99(3):267-276 [Online] http://www.sciencedirect.com/science/article/pii/S0168851010002526 [2013, 19 October]
47. Battersby J. (2011) The State of Urban Food Insecurity in Cape Town. Urban Food Security Series No. 11. Queen's University and AFSUN: Kingston and Cape Town. [Online] http://queensu.ca/samp/afsun/files/AFSUN_11.pdf [2013, 19 October]
48. Tracking Progress on Child and Maternal Nutrition, A survival and development priority. (2009) United Nations Children's Fund. [Online] http://www.unicef.org/publications/files/Tracking_Progress_on_Child_and_Maternal_Nutrition_EN_110309.pdf [2013, 19 October]
49. Bryce J, Coitinho D, Darnton-Hill I, et al. Maternal and child undernutrition: effective action at national level. Lancet 2008;371:510-526 [Online] http://www.sciencedirect.com/science/article/pii/S0140673607616948 [2012, 8 October]
50. Declaration of Alma Ata. International Conference on Primary Health Care, Alma-Ata, USSR, 6-12 September 1978 [Online] http://www.who.int/publications/almaata_declaration_en.pdf [2013, 19 October]

51. Primary Health Care Progress Report 2000. Cluster: Health Monitoring and Evaluation. [Online] http://www.info.gov.za/otherdocs/2000/dhis2000.pdf [2013,19 October]
52. Department of Health. (2012) Roadmap for Nutrition in South Africa for 2012-2016. Final Draft. Pretoria, South Africa.
53. Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa. 2012 – 2016 [Online] http://www.doh.gov.za/docs/stratdocs/2012/MNCWHstratplan.pdf [2013, 19 October]
54. The Scaling Up Nutrition (SUN) A Framework for Action. [Online] http://unscn.org/files/Activities/SUN/PolicyBriefNutritionScalingUpApril.pdf [2013, 19 October]
55. Bhutta ZA, Ahmed T, Black RE, et al. Maternal and child undernutrition: What works? Interventions for maternal and child undernutrition and survival. Lancet 2008;371:417-440 [Online] http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616936 [2013, 13 September]
56. Executive Summary: The Lancet Maternal and Child Nutrition Series. Published June 6, 2013. [Online] http://download.thelancet.com/flatcontentassets/pdfs/nutrition-eng.pdf [2013, 17 September]
57. Meyer A, Van der Spuy D, Du Plessis LM. The rationale for adopting current international breastfeeding guidelines in South Africa. Maternal and Child Nutrition 2007;3(4):271-280 [Online] http://onlinelibrary.wiley.com.ez.sun.ac.za/doi/10.1111/j.1740-8709.2007.00117.x/pdf [2013, 19 October]
58. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet: June 6, 2013 [Online] http://dx.doi.org/10.1016/S0140-6736(13)60996-4 [2013, 17 September]
59. Community survey 2007. Basic results. Statistics South Africa, 2007. [Online] Available: http://www.statssa.gov.za/Publications/CS2007Basic/CS2007Basic.pdf [2012, 7 October]
60. Smith LC, Haddad L. Overcoming Child Malnutrition in Developing Countries: Past Achievements and Future Choices. (2000) Food, Agriculture, and the Environment Discussion Paper 30. International Food Policy Research Institute. [Online] http://www.ifpri.org/sites/default/files/publications/2020dp30.pdf [2013,19 October]

61. CSDH. (2008) Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva, World Health Organization[Online] http://whqlibdoc.who.int/publications/2008/9789241563703_eng.pdf [2013, 17 September]
62. Pauw K, Mncube L The impact of growth and redistribution on poverty and inequality in South Africa. International Poverty Centre. Country study number 7, June 2007 [Online] http://www.ipc-undp.org/pub/IPCCountryStudy7.pdf [2013, 17 September]
63. Chitiga, M, Decaluwe, B, Mabugu, R, et al. The impact of the international economic crisis on child poverty in South Africa. University of Pretoria, Department of Economics, Working paper series, no. 2010-15. [Online] http://web.up.ac.za/sitefiles/file/40/677/WP_2010_15.pdf [2013, 17 September]
64. Kibel M, Lake L, Pendlebury S, et al. (eds) (2010) South African Child Gauge 2009/2010 Cape Town: Children's Institute, University of Cape Town ISBN: 978-0-9814320-4-5. Children's Institute, University of Cape Town [Online] http://opencontent.uct.ac.za/Health-Sciences/South-African-Child-Gauge-20092010 [2013, 19 October]
65. UNICEF. Millennium Development Goals. [Online] http://www.unicef.org/mdg/index_aboutthegoals.htm [2013, 19 October]
66. United Nations Development Programme, South Africa. [Online] http://www.undp.org.za/millennium-development-goals/mdgs-in-south-africa [2013, 19 October]
67. Global Study on Child Poverty and Disparities Guide, 2007- 2008, UNICEF. [Online] http://www.unicef.org/socialpolicy/files/UNICEFGlobalStudyGuide.pdf [2013, 19 October]
68. Budlender D, Proudlock P. The Children's Act has commenced: Are the 2010/11 budgets of the provincial departments of social development adequate to implement it? Children's Institute, University of Cape Town, 2010. [Online] http://www.ci.org.za/depts/ci/pubs/pdf/researchreports/ca_dsd_budget_analysis_jul10_all_provs.pdf africa [2013, 19 October]
69. Van der Berg S. (2007) Declining poverty in South Africa- The role of social grants. First annual conference on the Economics of Social Protection, Pilanesberg, 14 June 2007 [Online] http://web.up.ac.za/UserFiles/Keynote%20S%20van%20der%20Berg%20paper.pdf [2013, 19 October]

70. Agüero JM, Carter MR,Woolard I. (2007) The impact of unconditional cash transfers on nutrition: The South African Child Support Grant. International Poverty Centre. Working paper, no. 39. [Online] http://www.saldru.uct.ac.za/home/index.php?/component/option,com_docman/Itemid,32/gid,236/task,doc_download/ [2013, 19 October]
71. Armstrong P, Lekezwa B, Siebrits K. (2008) Poverty in South Africa: A profile based on recent household surveys. Stellenbosch Economic Working Papers: 04/08 [Online] http://www.ekon.sun.ac.za/wpapers/2008/wp042008/wp-04-2008.pdf [2013, 19 October]
72. Armstrong P, Burger C. (2009) Poverty, Inequality and the Role of Social Grants: An Analysis using Decomposition Techniques. Working paper (15/09) of the Department of Economics and the Bureau for Economic Research at the University of Stellenbosch [Online] www.ekon.sun.ac.za/wpapers/2009/wp152009/wp-15-2009.pdf [2013, 19 October]
73. Filmer D, Pritchett LH. Estimating wealth effects without expenditure data--or tears: An application to educational enrollments in States of India. Demography (pre-2011) 2001;38(1):115-132
74. Measuring poverty in South Africa. Statistics South Africa, Pretoria. (2000) [Online] http://www.statssa.gov.za/publications/statsdownload.asp?PPN=PovertyReport&SCH=2349 [2013, 17 September]
75. Mattes R. The Material and Political Bases of Lived Poverty in Africa. CSSR Working Paper No. 216, May 2008 [Online] http://www.cssr.uct.ac.za/publications/working-paper/2008/material-and-political-bases-lived-poverty [2013, 1 September]
76. Frayne B, Pendleton W, Crush J, et al. (2010) The State of Urban Food Insecurity in Southern Africa. Urban Food Security Series No. 2. Queen's University and AFSUN: Kingston and Cape Town. [Online] http://www.academia.edu/904314/The_State_of_Urban_Food_Insecurity_in_Southern_Africa_2010 [2013, 19 October]
77. Department of Social Development - Comprehensive Social Security. [Online] http://www.dsd.gov.za/index.php?option=com_content&task=view&id=43&Itemid=68 [2013, 19 October]
78. You and your grants 2013/14. [0nline] http://www.sassa.gov.za/Portals/1/Documents/05283ff8-ef75-4869-94b6-c026334269ef.pdf [2013, 23 September]

79. Coetzee M. Finding the Benefits: Estimating the Impact of the South African Child Support Grant. Stellenbosch Economic Working Papers: 16/11 [Online] www.ekon.sun.ac.za/wpapers/2011/wp162011/wp-16-2011.pdf [2013, 19 October]
80. Final People's Guide: Budget 2012, English version. Issued by National Treasury, Private Bag X115, Pretoria, 0001. [Online] http://www.treasury.gov.za/documents/national%20budget/2012/guides/People's%20Guide%202012%20-%20English.pdf [2013, 19 October]
81. Woolard I. (2003) Social Assistance Grants, Poverty and Economic Growth in South Africa. [Online] Available: http://www.tips.org.za/files/719.pdf [2013, 19 October]
82. Review of the Child Support Grant: Uses, Implementation and Obstacles. United Nations Children's Fund, June 2008. www.case.org.za [Online] http://www.case.org.za/images/docs/child_support_grant08.pdf [2013, 19 October]
83. Swart R, Sanders D, McLachlan M. Nutrition: A Primary Health Care Perspective. In: Barron P, ed. SA Health Review 2008 [Online] http://www.hst.org.za/publications/south-african-health-review-2008 [2013, 19 October]
84. Quantitative Analysis of the Impact of the Child Support Grant. United Nations Children's Fund, May 2008. [Online] http://www.unicef.org/southafrica/SAF_resources_qachildsupport.pdf [2013, 19 October]
85. GHS Series Volume I. Social Grants. In-depth analysis of the General Household Survey data 2003–2007 [Online] http://www.statssa.gov.za/publications/P03181/P031812007.pdf [2013, 19 October]
86. DSD, SASSA and UNICEF. (2012) The South African Child Support Grant Impact Assessment: Evidence from a survey of children, adolescents and their households. Pretoria: UNICEF South Africa. [Online] http://www.dsd.gov.za/index2.php?option=com_docman&task=doc_view&gid=286&Itemid=39 [2013, 19 October]

CHAPTER 3

ARTICLE 1: HOUSEHOLD FOOD AND NUTRITION SECURITY IN AVIAN PARK AND ZWELETEMBA

(To be submitted to Public Health Nutrition)

3.1 Abstract

Objective: To describe anthropometric status of mothers/ primary caregivers (PCGs) and their children; and their household food security and poverty in relation to type of housing.

Design: Cross sectional, descriptive study.

Setting: Randomly selected households in Avian Park (n=211) and Zweletemba (n=242) in Worcester, Western Cape, South Africa.

Subjects: Children, 0 – 36 months old, and their mothers/ PCGs.

Methods: Data collected by interviewer-administered questionnaires included socio-demographic data, Lived Poverty Index (LPI), Household Food Insecurity Access Scale (HFIAS) and dietary diversity score (DDS). Anthropometric measurements of mothers/PCGs included weight, height and waist circumference (WC) and for children weight, height and mid-upper-arm circumference. Households in formal (brick houses, town houses, flats) and informal (squatter shacks) houses were compared using X^2-test or independent t-test.

Results: Prevalence of stunting, underweight and wasting in children was 20.7%, 5.6% and 1.2% respectively. Overweight and obesity occurred in 27% and 37% of mothers/PCGs respectively; their mean WC (89.5 cm; SD 16.7) indicated increased risk for non-communicable diseases. Food security existed in 63% households. Formal households were more food secure than informal households (68% versus 50%; p=0.0004) and fewer mothers/PCGs of formal households had a DDS < 4 (52.2% versus 64.7%; p = 0.0157). Formal households had higher household income than informal households (R3479 versus R2316; p = 0.0009) and higher Household Assett Index (2.24 versus –5.31; p <0.0001).

Conclusions: Childhood malnutrition and maternal overweight /obesity co-existed. Improving the low dietary diversity should be a priority in interventions addressing food insecurity, taking into consideration that this may be more difficult to be achieved in informal households.

3.2 Introduction

Poverty is associated with household food insecurity, one of the underlying causes of under-nutrition amongst growing children in poor families.[1] Extensive reviews on maternal and child nutrition report the effect of nutrition on health and the links to child development. The complex interaction between social, economic and political determinants of undernutrition and how poverty exacerbates inequality in society is emphasised in these reviews.[2] Despite South Africa (SA) being food secure at national level,[3] socio-economic inequality related to housing, education, infrastructure, employment, job opportunities, income and distribution of wealth still exists resulting in

poverty, household food insecurity and undernutrition.[4] Poverty alleviation is a priority of the SA government but achieving is not as simple as the causes are complex and structured in the apartheid history. Addressing poverty and inequality is an extensive process time since it depends on socio-economic growth and development. Households' achievement of nutrition security requires access to adequate, safe and healthy food, health care, safe water, hygiene and sanitation, a healthy environment and adequate knowledge about a healthy diet, food hygiene and preparation. Poor people often lack this resources.[1]

Mattes[5] developed the Lived Poverty Index (LPI), in order to create an individual level measure of poverty that was both valid and reliable. The LPI enquires about poverty experience and deprivation of access to daily living basic necessities.[5] It was used by the African Food Security Urban Network in their "Rapid urbanization and the nutrition transition in Southern Africa" surveys in Cape Town, Msunduzi and Johannesburg in SA; and Harare, Windhoek, Blantyre, Maseru, Manzini, Lusaka and Gaberone in Southern Africa.[6,7] Poverty is commonly described by measuring household income, assets and expenditure, yet poverty depends not only on income, but also on access to services. Davids therefore suggests that the LPI should be included as one of the official poverty measures for SA.[8] Filmer and Pritchett[9] devised and validated the construction of the household asset index, a methodology that quantifies differences in household socio-economic status without household income information.[9] The LPI is a subjective measure of lived poverty asking people how frequently they go without basic necessities during the course of a year whilst the household asset index is an objective measure using socio-demographic data.

The development of a tool to assess dietary diversity[10] and the household food insecurity access scale (HFIAS)[11] has simplified household food security assessment. Dietary diversity reflects the number of foods eaten over a reference period and the Dietary Diversity Score (DDS) is a proxy of the nutrient adequacy of the diet. Several studies, in different settings and with different age groups, have shown that an increase in individual dietary diversity score is related to increased nutrient adequacy of the diet.[10] The HFIAS measures the prevalence and degree of food security, and reflects the food security status of a household in terms of access to food.[11]

Anthropometric measurements reflect body characteristics and are valuable to describe the prevalence of malnutrition, both under- and over nutrition, and relate to the indicators of food and nutrition security. A secondary analysis of the SA National Food Consumption Survey (1999) examined the determinants of the high prevalence of stunting as well as overweight and obese individuals in SA and found associations between poor socio-economic circumstances and the determinants of being overweight and stunted, e.g.

children of mothers or caregivers with lower education levels, or those living in informal housing, or with inadequate water and sanitation, had a significantly lower risk for being overweight and a significantly higher risk for being stunted.[12] This study furthermore found many of the determinants of childhood stunting and overweight in their mother/caregiver are similar, however the risk is opposite in relation to the specific socio-economic factors, for instance mothers and caregivers with lower education levels had a significantly lower risk for being overweight and a significantly higher risk for having stunted children.[5] Currently prevalence of overweight and obesity in children aged 2 – 5 year old is approximately 19% and 5% for girls and 18% and 4% for boys in SA.[13] In the adult population overweight and obesity is a vast problem, with the prevalence of overweight and obese adults respectively at approximately 25% and 39% amongst women, and 20% and 11% amongst men.[13]

This study described the anthropometric status of the mothers/ primary caregivers and their children, 0 – 36 months old, as well as their household food security and poverty experience in two study sites in SA. Food security and poverty in households living in formal (brick houses, town houses, flats) and informal (squatter shacks, huts) houses are described in terms of DDS[10] of mothers, HFIAS,[11] Household asset index and LPI[5]. The study further described the relationship between anthropometric status and food security and poverty experience. The results of this study will be used to inform collaborative planning of suitable food and nutrition interventions to address the problems identified.

3.3 Methods and materials

3.3.1 Subjects

This is a secondary analysis of data from the Community-Based Nutrition Security Project[14] (CNSP), a cross-sectional baseline assessment of a representative sample of households selected by simple random selection in two residential areas, Avian Park and Zweletemba, in Worcester, the largest town in the Western Cape of SA's interior region. The study was performed according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects were approved by the Stellenbosch University Health Research Ethics Committee. Written informed consent was obtained from all participants.

The study population comprised 211 and 242 households in Avian Park and Zweletemba respectively. The determinants of household food security of mothers/primary caregivers and their children, 0 – 36 months old were explored. The required sample size of 170 mothers/primary caregiver and 170 children per area was based on a power analysis with one way ANOVA, and a 5% significance, to provide 90% power and detect an effect size of $\delta = 0.25$, with 5% significance for stunting. The final sample size was

adjusted to 200 mothers/primary caregivers and their children to allow for an expected 85% response rate.

3.3.2 Questionnaires

The following questionnaires were included in this study:

- Socio-demographic , which included the Lived Poverty questions
- Diet diversity
- Household food insecurity access scale

Residents of Avian Park and Zweletemba were recruited as fieldworkers and trained for data collection. The diet diversity and household foodinsecurity access scale tools were developed and validated by Food and Nutrition Technical Assistance III Project.[10,11] All questionnaires were first tested on the fieldworkers during their weeklong training programme which was based on procedure in the CNSP field work manual.[15] Therafter the full data collection process was tested in the field during the four day long pilot study. The dietary diversity questionnaire was adapted to suit the local context with input from fieldworkers, who were residents of the community in which the study took place. All consent forms and questionnaires were available in English, Afrikaans and Xhosa. The exception was the dietary diversity questionnaire, as the fieldworkers conducted the 24 hour dietary recall interview in Xhosa, (where appropriate) and then completed the English or Afrikaans dietary diversity questionnaire based on the 24 hour dietary recall information. Data collection took place between March and July, 2011. During data collection, fieldworkers visited homes in teams of two and anthropometric measurements were taken by dieticians.

This secondary analysis included selected data from the socio-demographic questionnaire, the LPI questionnaire,[5] the HFIAS,[11] dietary diversity questionnaire[10] for the mother/primary caregiver and anthropometric data of the mothers/primary caregivers and children.

3.3.3 Anthropometry

The height or length, weight, and mid-upper arm circumference (MUAC) measurements of children aged 0-36 months old and the weight, height and waist circumference (WC) measurements of mothers/primary caregivers were taken according to World Health Organization (WHO) standard procedures[15,16,17,18] by two dieticians assisted by two trained assistants. The WC measurement was taken midpoint between the iliac crest and the lower border of the rib cage.[18] Length measurements for children under 24 months old were done with a Seca 417 baby measuring board, and height measurements for adults and children older than 24 months with a Seca 217 stadiometer.

Weight was measured, to the nearest 0.1 kg, with a Seca 877 electronic scale. Mid-upper

arm circumference of the children was measured with a Seca non-stretchable measure tape, to the nearest 0.1 cm. Two measurements were taken, and if it differed with more than 0.5 kg for weight, 1 cm for height and length, or 0.5 cm for MUAC a third measurement was done, to ensure accuracy. Children's age, weight and height were used to calculate weight–for–age Z–scores (WAZ), height–for–age Z–scores (HAZ), weight–for–height Z–scores (WHZ) and BMI (body mass index)–for–age Z–scores (BAZ). Underweight is defined as WAZ more than two SD below the median of the reference population, stunted as HAZ more than two SD below the median of the reference population, wasted as WHZ more than two SD below the median of the reference population, and overweight as BAZ more than two SD above the median of the reference population.[19] MUAC below 11.0 cm can be used for screening severely malnourished children and 11 – 12.5 cm is classified as moderate or severe malnutrition depending on the presence of oedema or not.[17]

Height and weight of mothers/primary caregivers were used to calculate BMI, which is the ratio of weight (in kg) to height (in m^2). Participants were classified according to the WHO body size classifications, as either underweight (BMI < 18.5 kg/m^2), normal weight (BMI = 18.2 – 24.99 kg/m^2), overweight (BMI = 25 – 29.99 kg/m^2) or obese (BMI ≥ 30 kg/m^2).[15]

3.3.4 Individual Diet Diversity scores

Fieldworkers completed a 24 hour recall of the food intake of the mothers/ primary caregivers and used the information to complete the dietary diversity questionnaire. This information was used to calculate the DDS as is an indicator of the nutritional quality of the diet. The nine food groups' method described by Hatloy et al.,[20] also used by Faber et al.,[21] Labadarios et al.[22] and Oldewage-Theron et al.[23] in SA, were used to analyse dietary diversity. These food groups are (1) cereals, grains and roots; (2) vitamin A-rich fruit and vegetables; (3) fruit other than vitamin A-rich; (4) vegetables other than vitamin A-rich; (5) meat, poultry and fish; (6) eggs; (7) legumes, nuts and seeds; (8) dairy products and (9) oils and fats. Sugars and beverages were not included when calculating the DDS as these foods do not add to the nutritional quality of the diet. The lowest potential DDS is zero and maximum is nine. A DDS below four is seen as poor dietary diversity.[24]

3.3.5 Household food insecurity access scale (HFIAS)

The HFIAS[11] comprises nine questions to assess respondents' feelings and perceptions about the access domain of food insecurity to estimate the prevalence of household food insecurity. The scale has been validated in different settings, is simple to administer and analyse, and captures the human dimension to food insecurity. Respondents were asked to consider whether any nine food insecurity related conditions had occurred in the past 30 days; For affirmative responses, the frequency was recorded as rarely (once or twice),

sometimes (3 to 10 times) or often (more than 10 times) over the past 30 days. A value was assigned for each response per condition (never = 0; rarely = 1; sometimes = 2 and often = 3) and the HFIAS score was calculated by summing the frequency of the nine food insecurity related conditions. The maximum possible score was 27, when "often" is answered for all nine conditions, and zero is the lowest possible score, where the response for all nine conditions is "never". Thus, the higher the score, the more food insecurity the household has experienced in terms of food access. The nine questions regarding the different conditions in the HFIAS were grouped in three domains, namely, 1) *anxiety and uncertainty about household food supply; 2) insufficient food quality and* 3) i*nsufficient food intake and its physical consequences,* therefore it is also possible to report prevalence of food insecurity in these terms.

3.3.6 Household Asset Index

Household wealth cannot always be assessed simply by looking at household income, since ownership or lack of basic and luxury assets, such as a flush toilet, running water in the house, microwave oven and television in a working condition, as well as consumption items such as electricity or paraffin are also an indication of household wealth. In this study a number of variables in the socio-demographic questionnaire were used to calculate a HHAI to be used as a control for household income. The following variables were included to calculate the HHAI score: type of house/dwelling; number of people per room; drinking water in house; flush toilet; fuel available for cooking; working refrigerator/ freezer; electric/gas/coal stove; primus or paraffin stove; microwave oven; electrical hotplate; radio and/ or television; landline and/ or cellular telephone. Filmer and Pritchett[9] devised this specific methodology to construct a HHAI from the selected household asset indicators for every household. Principal component analysis is a data reduction method that extracts from a selected set of variables those few directly related combinations of the variables that capture the common information most successfully.[25] The first step of the process was coding the household variables into dichotomous variables, by distinguishing whether a household owned the particular variable or not, if they answered yes and no, and these responses were scored as either zero or one. The number of people per room was the only variable that was included in the principal component analysis as a continuous variable. Thereafter a scoring factor was estimated with principal analysis for every variable. The score of each variable was standardised in relation to the unweighted mean and standard deviation of the particular variable and therafter the resulting scores were weighed with the scoring coefficient for that variable. The value of the HHAI was calculated by summing the score on each variable across the variables in the principal component analysis.

3.3.7 Lived Poverty Index (LPI)

The LPI[7] is a subjective measure of poverty, with questions enquiring about vital resources for daily living, to assess the poverty experienced. The answer is customarily requested for the past year, however in this study the questions were in relation to the experience in the past month. Households were asked how often they have gone without: (a) enough food to eat, (b) enough clean water for home use, (c) medicine or medical treatment, (d) electricity for their home, (e) enough fuel to cook their food, and (f) a cash income in the past year or month. The LPI index score ranges from 0 for *no lived poverty* to 4 for *complete lived poverty.*

3.4 Data analysis

Data collected were captured in Microsoft Excel and WHO Anthro (version 3.2.2)[25] and analysed with SAS 9.3 (2002 – 2010), SAS Institute Inc. Cary, NC, USA. Children's age, weight and height were used to calculate WAZ, BAZ and HAZ and data were interpreted with WHO child growth standards and cut-of values.[19] Adult womens' BMI and WC was interpreted using the WHO 2000 Consultation on obesity and 2008 WC and waist–hip ratio reference guidelines.[18,26] Data were described using means, standard deviations and percentages. Households living in formal and informal houses, referred to as formal and informal households, were compared using the Chi-square test for categorical data and the independent T-test for continuous data. Level of significance was set at 0.05.

3.5 Results

The study sample comprised of 447 households, of which 314 lived in formal housing (brick houses, town houses and flats) and 133 in informal housing (squatter shacks or huts). The age of mothers/primary caregivers ranged from 15 to 79 years old, with a median of 47 years. Nine percent of children were being cared for by their grandmothers. The age of 39% of mothers/primary caregivers were above the mean age of 30.5 years, whilst the other 61% were below the mean age; only 9% of mothers/primary caregivers were between 15 and 20 years old. The age of the majority of the mothers/primary caregivers (53%) ranged between 20 and 30 years old.

The anthropometric data of the mothers/primary caregivers and the children aged 0 – 36 months are shown in Table 3.1. The number of mothers/primary caregivers for whom data are reported is 446 since anthropometric measurements were not taken where the father was the primary caregiver or where the mother/primary caregiver was pregnant. Sixty three percent of all mothers/primary caregivers were overweight and obese and 2.8% were underweight. A chi-square test showed a significant relationship between BMI of mothers/primary caregivers and housing ($p = 0.0325$). In formal households, 24.8%

women were overweight and 40.5% obese versus 30.3% overweight and 29.6% obese in informal households. The waist circumference of mothers/primary caregivers in formal households was significantly larger than that of mothers/primary caregivers in informal households (90.5 vs. 87.2 cm, t-test: p= 0.0391). The mean WC of mothers/primary caregivers in formal and informal housing was above the cut-off point of 88 cm, which indicates a substantial increased risk for chronic diseases of lifestyle.[26]

Table 3.1: Anthropometric status of mothers/primary caregivers and children by type of housing

Mothers/primary caregivers	**ALL %** n = 446	**Formal housing %** n = 314	**Informal housing %** n = 132	**p-value**
BMI < 18. 5 kg/m2	3.8	4.8	1.5	
BMI 18.5– 25 kg/m2	32.5	29.9	38.6	X^2-test: p = 0.0325
BMI 25–30 kg/m2	26.5	24.8	30.3	
BMI ≥ 30 kg/m2	37.2	40.5	29.6	
Waist Circumference (cm)	89.5 (16.7)	90.5 (17.6)*	87.2 (14.0)	t-test: p= 0.0391
Children 0-36 months	n = 430	n = 304	n = 126	
Underweight (WAZ ≤– 2)	5.6	5.3	6.4	p = 0.6552
Stunted (HAZ ≤– 2)	31.2	30.3	33.3	p = 0.5316
Overweight (BAZ ≥2)	20.7	21.1	19.8	p = 0.7780

Values are expressed as %, except where otherwise indicated as mean (standard deviation) or as a score
BMI = Body Mass Index; WAZ = weight-for-age Z-score; HAZ = height-for-age Z-score; BAZ = BMI-for-age Z-score;
Chi-square (X^2)-test for categorical data; t-test for continuous data
Waist circumference: mean value and (SD)

In the children the prevalence of underweight individuals was 5.6%, and 1.2% were classified “wasted”. There were no significant differences in the prevalence of underweight, stunted and overweight children in formal and informal housing. Growth faltering was reflected by the high negative HAZ values that were skewed to the left, and stunting was prevalent in 31.2% of children aged 0-36 months. The severity of stunting found in this study was high according to the WHO classification for stunting.[15]

Table 3.2: Comparison of anthropometric status of boys and girls by type of housing

	ALL % n = 430		**Formal housing %** n = 304		**Informal housing %** n = 126	
	Boys (n=219)	**Girls** (n=211)	**Boys** (n=152)	**Girls** (n=152)	**Boys** (n=67)	**Girls** (n=59)
Underweight (WAZ ≤2SD)	7.3	3.8	6.6	4.0	9.0	3.4
Stunted (≤-2SD HAZ)	35.2	27.0	32.2	28.3	41.8*	23.7
Overweight (≥+2 SD BAZ)	21.9	19.4	22.4	19.7	20.9	18.6

WAZ = weight-for-age Z-score; HAZ = height-for-age Z-score; BAZ = BMI-for-age Z-score;
*Chi square p-value<0.05 (p=0.0310); all values are given as a percentage

A comparison of the anthropometric status of boys and girls (table 3.2) showed that in terms of underweight, stunting and overweight there was no statistically significant

relationship between boys and girls, but there was a significant relationship between gender and stunting in the informal households (48.1 vs. 23.7; X^2-test: p = 0.0310), with boys having a higher probability of being stunted. The mean WAZ values of children aged 0 – 12 months, shown in Table 3.3, was 0.18 (SD: 1.35) for formal households versus – 0.35 (SD: 1.15) for informal households, and an independent t-test showed that this difference was significant (p = 0.01), suggesting that the weight for age (W/A) of younger children living in formal housing tended to be higher than that of children in informal housing. Similarly there was a significant difference (t-test: p = 0.02) in the mean BAZ values of children aged 0 – 12 months in formal households, which was 0.96 (SD: 1.33) versus 0.48 (SD: 1.2) in informal households, indicating that the trend of higher W/A in children under 12 month old was also present in terms of BMI for age (B/A) when comparing children living in formal versus informal households. The prevalence of overweight individuals, indicated with B/A, for all children was 20.2%, which is high when compared to the national prevalence of overweight in children aged 0 – 36 months old reported by Kruger in 2005.[27] SANHANES-1, using the Cole classification of BMI cut points to describe overweight (BMI 25 – 29.9) reports a prevalence of 18.9 % of overweight girls and 17.5% overweight boys aged 2 – 5 years old.[13]

Table 3.3: Anthropometric status of children in different age categories by type of housing

	0-12 months		12-24 months		24-36 months	
	Formal (n=144)	**Informal** (n=54)	**Formal** (n=83)	**Informal** (n=31)	**Formal** (n=74)	**Informal** (n=39)
	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)	Mean (SD)
WAZ	0.18 (1.35)★ ★p = 0.01	– 0.35 (1.15)	– 0.80 (1.22)	– 2.22 (0.89)	– 0.25 (1.11)	– 1.75 (0.97)
HAZ	-0.88 (1.42)	– 1.21 (1.38)	– 1.79 (1.27)	– 2.22 (1.15)	– 1.58 (1.22)	– 0.37 (0.87)
BAZ	0.96 (1.33) ★ ★p = 0.02	0.48 (1.20)	1.39 (1.12)	1.53 (0.84)	1.1 (1.07)	1.09 (0.96)
MUAC (cm)	14.33 (1.95)	14.13 (1.51)	15.67 (1.27)	15.54 (1.15)	16.3 (1.4)	16.23 (1.12)

WAZ = Weight-for-age Z-score; BAZ = BMI-for-age Z-score; HAZ = height-for-age Z-score; MUAC = Mid-upper arm circumference; ★= t–test

The prevalence of food security, as measured with the HFIAS, was 63.1% for the total study population of Avian Park and Zweletemba, with no significant difference in the prevalence of household food insecurity in Avian Park (39%) and Zweletemba (35%). In Table 3.4 the formal and informal households were compared in terms of the DDS of mothers/primary caregivers, household food security status as determined by the HFIAS, household income, and poverty experience. There was a significant relationship between type of housing and household food security status, with those living in formal houses having a higher probability of being food secure (X^2-test: p < 0.0004). There was a significant difference between the mean HFIAS scores of formal and informal households (2.53 vs. 4.77; t-test: p = 0.0002), pointing towards the higher food security in terms of

access to food in formal households. The HFIAS conditions relate to three access-related domains of food insecurity; when the households experience were assessed according to these three HFIAS domains, the prevalence of facing the situation where they need to take in food of insufficient quality (domain 2) was lower in formal households than in informal households. A situation of having insufficient food to take in and experiencing the physical consequences there-of, as described in domain 3, was also less in formal households than in informal households. Table 3.4 shows there was no difference between formal and informal households for the first (and less severe) domain, but there was a difference for the two more serious domains, i.e. a significant difference for *insufficient food quality* (28.6% vs. 47.4%; $p < 0.01$) and a highly significant difference for *insufficient food intake and its physical consequences* (28.6% versus 48.1%; $p < 0.0001$).

Table 3.4: Comparison of household food security and poverty experience in formal and informal households using Household Food Insecurity-Access Score, Individual Dietary Diversity Score, household income and Lived Poverty Index

	ALL % (n =445)	**Formal household %** (n = 312)	**Informal household %** (n = 133)	**p-value**
Household Food (in)security Status				
Food secure	63.1	68.3	50.4	X^2-test p = 0.0004
Mildly food insecure	4.4	4.4	4.5	
Moderately food insecure	21.9	20.1	26.3	
Severely food insecure	10.6	7.2	18.8	
Household Food Insecurity Access Scale (HFIAS) score	3.19 (5.23)	2.53 (4.63)	4.77 (6.17)	t-test P = 0.0002
HFIAS Access-related domains				
1. Anxiety and uncertainty about household food supply	32.2	29.6	38.4	X^2-test P = 0.0685
2. Insufficient food quality	34.2	28.6	47.4	X^2-test P < 0.01
3. Insufficient food intake and its physical consequences	34.4	28.6	48.1	X^2-test P < 0.0001
Dietary Diversity Score (DDS): Mother/primary caregiver DDS 0 – 4 DDS 5 – 9	 56.0 44.0	 52.2 47.8	 64.7 35.3	X^2-test p = 0.0157
Mean DDS (SD)	4.38 (1.6)	4.53 (1.64)	4.04 (1.45)	t-test P = 0.0031
Household income per category				
No income	0.9	1.0	0.8	X^2-test P = 0.0837
R1-500	8.0	6.3	12.2	
R501-R1000	10.5	9.8	12.2	
R1001-R3000	42.1	40.4	45.8	
R3001-R5000	18.5	19.6	16.0	
Over R5000	15.9	18.6	9.2	
Don't know	4.2	4.4	3.8	
Mean total income from all sources (SD) **Median income (minimum and maximum)**	R3136 (SD:4494) 2120 (0 - 60000)	R3479 (SD:51093) 22 (0 - 60000)	R2316(SD:22810) 1800 (0 - 18700)	t-test p = 0.0009
Average household size mean, SD, median (min and max)	4.8 (1.8) n=447	5.0 (1.8) n=315	4.3 (1.7) n=132	t-test P < 0.0001
Lived Poverty Index	3.08 (0.79)	3.18 (0.76)	2.84 (0.81)	t-test P < 0.0001

Values are expressed as %, except where otherwise indicated as mean (standard deviation) or as a score

A comparison of the responses of formal and informal households concerning the nine possible household food insecurity access-related occurrence questions with a Chi-square test showed that families living in formal households versus those in informal households had a significant smaller probability ($p < 0.05$ or $p < 0.01$) to experience any of the nine occurrences probed with the HFIAS questionnaire, indicating that formal households were less prone to experience an increase in the severity of household food insecurity compared to informal households.

The difference between the mean DDS of mothers/primary caregivers living in formal households (4.53; SD 1.64) versus informal household mothers/primary caregivers (4.04; SD 1.45) was significant (t-test: $p = 0.0031$), indicating that mothers/primary caregivers living in informal households had a higher probability of consuming a diet of poor nutritional quality A Chi-square test showed a significant relationship between type of housing and dietary diversity ($p = 0.0157$) when DDS ≤ 4 or DDS of 5 – 9 of mothers/ primary caregivers in formal and informal households were compared, confirming that the dietary diversity in formal households were better that in informal households.

Data regarding income categories and total income received from all possible household income sources is summarised in Table 3.4. The total income of formal households was significantly more than that of informal households (t-test: $p = 0.001$). The distribution of household income per category shows that 38% of formal households earn R3001 or more per month compared to 25% of informal households. The average household size in formal households was 5.0 (1.8) persons vs. 4.3 (1.7) persons in informal households, and this difference was significant (t-test: $p < 0.0001$) indicating that there were more people living together in the formal houses, but this also means that the higher household income in formal households were shared amongst more people in formal households.

Lived Poverty Index score is a subjective measure of the households' poverty experience and lack of access to daily living essentials, and in this study the reporting related to the poverty experience *over the past 30 days.* Formal households had a significantly higher mean LPI than informal households (3.18 vs. 2.84; $p < 0.0001$). Considering that LPI index score ranged from 0 for *no lived poverty* to 4 for *complete lived poverty* this finding indicated that formal households experience more poverty than informal households, which is a surprising and questionable finding, specifically when the data is observed critically. The LPI and similar data from the socio-demographic questionnaire is shown in Table 3.5. From the significant relationships between type of residence and drinking water from own tap; using electricity for cooking most of the time and food secure households as well as the total household income it is possible to speculate that there was a problem with the way the LPI questions were understood or interpreted by either participants or the fieldworkers. Due to the uncertainty regarding the assessment and correctness of the LPI data it was not included in any further analysis of data.

Table 3.5: Comparison of the 6 Lived Poverty Index (LPI) responses and similar socio-demographic questions

	LPI responses						Socio-demographic responses			
	Not enough food to eat	Not enough clean water for home use	No medicine/ medical treatment	No electri-city in home	Not enough fuel to cook food	No cash Income	**HFIAS** Food secure house-holds	Total monthly income	Use electri-city for cooking most of time	Drinking water from own tap
Formal housing % (n=318)										
Never/Don't know/ missing	2.1	1.0	19.7	4.4	4.8	3.1	68.3 p=0.0004 [a]	R3459 p=0.013 [b]	96.2 p<0.01 [a]	98.1 P <0.0001 [a]
Once/Twice	10.7	1.0	25.7	3.8	4.8	26.4				
Several times	6.3	1.0	7.0	2.9	3.2	5.7				
Many times	12.6	4.4	7.3	10.1	13.2	19.8				
Always	68.1	92.7	40.3	78.8	74.0	45.0				
Informal housing% (n=133)										
Never/Don't know/ missing	0.8	3.8	25.2	10.7	5.3	1.5	50.4	R2306	87.2	45.1
Once/Twice	16.5	5.3	35.1	6.1	7.6	24.8				
Several Times	20.3	5.3	8.4	6.9	12.2	16.5				
Many times	12.8	6.8	3.8	13.0	15.3	17.3				
Always	49.6	79.0	27.5	63.4	59.5	39.9				

Household Food Insecurity-Access Score=HFIAS; [a] indicates x^2 test and [b] the T-test

The Household Asset Index (HHAI) is a proxy for long-run household wealth, or lack thereof, and a convenient control for household economic status. Since this index is constructed using a number of different assets that are essential for a household's health and welfare, it is an additional objective tool to assess the socio-economic status of households. The mean HHAI of formal households was 2.24 (SD = 1.47) vs. –5.31 (SD = 3.57) of informal households. An independent t-test showed this difference was significant ($p < 0.0001$). A comparison of formal and informal households in quintiles according to HHAI showed that 91 formal households lay the third quintile, 90 formal households were in the fourth quintile and 91 in the fifth quintile, thus the HHAI of 272 of 318 households represented the upper 60 % of HHAI scores, whilst 84 of informal households lay the bottom quintile and the remaining 49 informal households were in the second quintile. A Chi-square test showed a significant difference ($p< 0.0001$) when the HHAI of formal and informal households, divided in quintiles, was compared, indicating that the socio-economic status of formal households was considerably better in formal households. The difference in the situation of formal and informal households, divided in quartiles, is shown in figure 3.1. The higher and positive HHAI in all quartiles for formal housing clearly illustrates the healthier socio-economic situation in these households as compared to the negative HHAI in all quartiles of informal households.

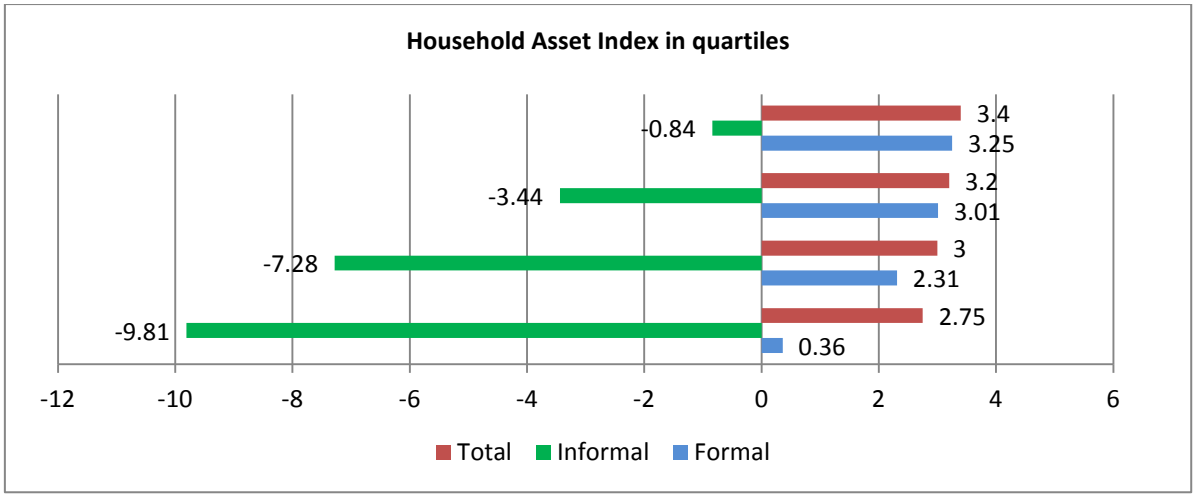

Fig. 3.1: Household Asset Index of Formal and Informal Households divided in quartiles

To describe the relationship between the anthropometric status of the mothers/primary caregivers and the anthropometric status of their children, the household food security, the mothers/primary caregivers' dietary diversity, the household income and HHAI, a Bonferroni multiple-comparison procedure was performed with the relevant variables. Table 3.6 shows the BMI for-age Z-scores of children, HFIAS scores, DDS of mothers/primary caregivers, household income, HHAI in relation to the anthropometric status of the mothers/ primary caregivers, distributed by BMI categories. The Bonferroni multiple-comparison procedure showed that there were no significant differences for any of these variables between the BMI groups.

Table 3.6: Poverty experience, household income, household asset index, Individual Dietary Diversity Score, Household Food Insecurity-Access Score and BMI for-age Z-score of children according to anthropometric status of mothers/ primary caregivers

Mothers/ primary caregivers BMI	**BAZ of children** Mean (SD)	**HFIAS score** Mean (SD)	**DDS** Mean (SD)	**Household income** Mean (SD)	**Household Asset Index** Mean (SD)
BMI < 18. 5[$] n=17	0.76 (1.38)	4.12 (6.28)	4.18 (2.13)	R1983 (R1881)	0.94 (3.52)
BMI 18.5–25 n=145	0.97 (1.12)	3.39 (5.63)	4.38 (1.66)	R2898 (R3044)	– 0.72 (4.71)
BMI 25– 30 n=118	1.16 (1.05)	2.59 (4.65)	4.33 (1.53)	R3414 (R3004)	– 0.27 (4.31)
BMI > 30 n=166	1.08 (1.33)	3.42 (5.20)	4.42 (1.54)	R3545.(R6416)	0.75 (3.34)

[$] There are no significant differences for any of these variables between BMI groups;
Bonferrroni multiple comparison tests found all p-values > 0.05

Subsequently, Spearman correlation coefficients were used to determine the extent to which the different variables are linearly related. Spearman correlation coefficients were determined for anthropometric status of the mothers/primary caregivers and DDS of mothers/primary caregivers, BMI for–age Z-scores of children, monthly household income, household assets index and HFIAS. The results of Spearman correlations are shown in Table 3.7. A significant positive correlation was found for BMI of

mothers/primary caregivers and HHAI (r = 0.107, p = 0.024) indicating that mothers/primary caregivers of better socio-economic status had higher BMI's. The significant inverse correlation for DDS of mothers/primary caregivers and HFIAS (r = – 0.097, p = 0.042) indicated that dietary variety (and thus assuming nutritional quality of the diet) was better for mothers/primary caregivers who were food secure. This was supported by the significant positive correlation between DDS and monthly household income (r = 0.116, p = 0.016), which showed that mothers/primary caregivers from households with a higher income consumed a more varied diet.

The significant positive correlation between DDS of mothers/primary caregivers and HHAI (r = 0.216, p < 0.0001) indicates the higher dietary diversity of mothers/primary caregivers with a better socio-economic status. The significant inverse correlations for HFIAS and monthly household income (r = – 0.347, p < 0.0001) and HHAI (r = – 0.254, p < 0.0001) suggest that household food security was associated with higher household incomes and better socio-economic conditions. For HHAI and monthly household income (r = 0.223; p < 0.0001) the significant positive correlation confirmed what is obvious that households with higher incomes have better socio-economic conditions. The correlations for LPI with the other variables were not included due to the problem identified with the LPI data.

Table 3.7: Spearman correlation between anthropometric status of mother/primary caregiver and BMI for-age Z-score of children, Household income, Household Asset Index, Lived Poverty Index, Dietary Diversity Score and Household Food Insecurity-Access Score

	BMI of mothers/ primary caregivers	BAZ of children	mother/primary caregiver DDS	HFIAS	Monthly household income	Household Asset Index
BMI of mother/ primary caregiver	–	r= 0.082 p=0.088	r=0.042 p= 0.376	r=0.008 p=0.860	r=0.024 p=0.624	r= 0.107 p= 0.024*
BAZ of children	–	–	r=0.038 p=0.430	*r=–0.055* p=0.260	r=0.049 p=0.320	r=0.035 p=0.466
mother/ primary caregiver DDS	–	–	–	*r=–0.097* p=0.042*	r=0.116 p=0.016*	r=0.216 p <0.0001*
HFIAS	–	–	–	–	*r=–0.347* p <0.0001*	*r=–0.254* p <0.0001*
Monthly household income	–	–	–	–	–	r=0.223 p<0.0001*
Household Asset Index	–	–	–	–	–	–

BMI for-age Z-scores=BAZ; Dietary Diversity Score = DDS; Household Food Insecurity-Access Score= HFIAS;

3.6 Discussion

The communities of Avian Park and Zweletemba are situated in Worcester, in the Breede Valley, a peri-urban district of the Western Cape Province. According to the Breede Valley Municipality's Integrated Development Plan, 2007-2011,[28] both communities have a low

socio-economic status with high unemployment levels, and there is a high prevalence of tuberculosis, HIV/AIDS, tobacco smoking, and drug and alcohol abuse. The purpose of this study was to describe the nutrition security in these communities, and develop an in-depth understanding of the immediate and underlying factors that influence young child growth in order to plan appropriate intervention programmes that will enable these communities to improve their nutrition security. This study is the first report on both anthropometric status of mothers and children as well as the household food security status at community level of this population.

The study found that the prevalence of overweight and obese women was similar to that reported by SANHANES-1, but stunting in children was at higher levels than reported by SANHANES-1 and other studies in SA.[4,12,13,27,29,30] The prevalence of stunting in children aged 0-3 years old was 35.2% for boys and 27% for girls compared to the 26.9% for boys and 25.9% for girls reported by SANHANES-1.[13] The prevalence of overweight in children was also higher than in the National Food Consumption Survey (NFCS) of 1999[29] and 2005[4]. The fact that the CNSP[14] deliberately chose a low socio-economic area to conduct this study, because it aimed to assess the determinants of nutrition security, explains why the levels of stunting in children are higher than that reported in national studies in SA, i.e. the SANHANES-1[13] and NFCS-FB-1.[4] The high levels of stunting and overweight in children under 3 years old in this study population is of concern and requires appropriate intervention.

Victora et al.[31] reported that stunting or linear growth failure is caused by inadequate maternal nutrition during pregnancy as well poor nutrition and regular infections in the first two years of a child's life. Cogill proposed that stunting in children younger than two years is an indicator of food security since the latter is associated with poverty.[17] The prevalence of stunting in the developing world is high. Black[2] stated in the 2013 Lancet Maternal and Child Nutrition Review that "stunted linear growth has become the main indicator of childhood undernutrition", since it is a better indicator of chronic malnutrition than underweight in children, and has important consequences for health and development. The 2008 and 2013 Lancet Maternal and Child Nutrition Reviews provided significant evidence for focusing intervention, to address stunting, on the first thousand days after conception.

Stunting has substantial consequences for health and development and therefore Black et al. proposed that height for age (H/A) should replace W/A as the main anthropometric indicator for children.[2] In SA, H/A and weight for height (W/H) were included to be recorded regularly in the new Road to Health booklet implemented in February 2011. It is, therefore, possible to use health-facility based intervention programmes i.e. the Mother Baby Friendly Initiative, growth monitoring using the Road to Health booklet, Integrated

Management of Childhood Illnesses and the Nutrition Therapeutic Programme[32,33] to identify growth faltering and intervene promptly to assist in the prevention of stunting in children younger than two years old in SA.

The NFCS[30] found that certain economic indicators, including living in an informal housing structure, were associated with being overweight and stunted. This study also found a significant relationship between gender and stunting amongst children living in informal housing, with the prevalence of stunting being higher amongst boys. The finding of a higher prevalence of overweight girls than boys was similar to SANHANES-1.[13]

Most studies in SA report a higher prevalence of overweight and obese women than men.[13,34] The significant relationship between the BMI of mothers/primary caregivers and housing indicates that women living in formal households having a greater probability of being underweight, overweight and obese. The household income and HHAI confirmed the better socio-economic situation the women in this study living in formal households. The high prevalence of overweight (26.5%) and obese (37.2%) individuals in all households in this study requires special consideration in the planning of interventions to improve the nutrition security in these communities. The mean waist circumference and prevalence of overweight and obese mothers/caregivers were similar to that of female adults in SANHANES-1.[13]

The co-existence of stunting in children and overweight women in SA has been previously reported by Kruger et al.[27] and Smuts et al.,[35] and was also showed by SANHANES-1.[13] The vulnerability and greater risk for children, aged 1 to 3 years old, living in informal households to become stunted and overweight was also reported by Steyn et al.[12] The problem of childhood obesity exists and is increasing in SA and globally in developing and developed countries. Black stated that overweight children are becoming an increasingly important contributor to adult obesity, diabetes, and non-communicable diseases. Overweight children are also associated with growing up in a conducive environment where population changes in physical activity and diet are the main drivers.[2] Being overweight as a child is also a strong risk factor for adult obesity and its consequences.[29,31] Furthermore, it is important to consider that stunted people will have lower nutritional requirements than those who have had normal growth,[31] and they are at risk to become overweight if they do not adapt their dietary intake accordingly. The World Health Assembly[36] endorsed the WHO Global Action Plan for the Prevention and Control of Non-communicable Diseases 2013–2020 in May 2013.[37] This plan also mentions that childhood obesity is serious public health challenge that needs urgent attention. WHO has two other relevant documents namely the Global Strategy on Diet, Physical Activity and Health,[38] and Population-based approaches to childhood obesity prevention[39] that focuses on intervention strategies and programmes to address the problem of childhood obesity.

There was a significant relationship between housing group and DDS of the mothers/primary caregivers. This finding indicates that it is more difficult for households in informal settlements to get regular access to a variety of food, since dietary diversity is a proxy measure for the access dimension of household food security.[10] The mean DDS of mothers/primary caregivers is only just above 4, the cut-off level indicating dietary inadequacy, and the DDS was similar for the different BMI categories. Labadarios et al.[40] (2011) reported a mean dietary diversity score of 4.02 at national level for SA, with significant differences between provinces. They specifically mentioned that they finding poor dietary diversity amongst only 15.7% of participants in the Western Cape.

The CNSP, however, found poor dietary diversity in just over half of all households. The positive correlation between mothers/primary caregivers' DDS and household income and HHAI showed that there is an association between DDS and income or socio-economic situation, and thus it is possible that dietary diversity of households could improve with an improvement in their socio-economic situation. The low mean DDS as well as the finding that 52% of formal households had a DDS below 4, indicating dietary inadequacy, confirmed that there is a need for nutrition education to improve diet quality, in these communities, irrespective of the significant difference in household income of those living in formal houses versus informal houses. Likewise, Labadarios et al.[40] reported the highest mean dietary diversity scores in urban formal areas (DDS = 4.42) and amongst households with the highest Living Standards Measurement. The latter is a classification system for living standards that uses criteria such as degree of urbanization, ownership of cars, and major appliances, to categorize people. Faber et al.[21] also found a similar trend that households with fewer household and financial assets had lower dietary diversity. There was no correlation between mothers/primary caregivers' DDS and their BMIs, suggesting that access to an adequate diet in terms of is dietary diversity affected everyone, regardless if they are fat or thin. A paper by Headey and Ecker[41] reviewed different food security measurement options and concluded that dietary diversity indicators, in comparison with calorie availability/ deprivation, monetary poverty and subjective indicators are powerful predictors of economic status and malnutrition in the form of stunting and wasting. Ruel[42] reported a strong association between dietary diversity and household socio-economic characteristics, child nutritional status and growth in a number of developing countries. This study also showed poor dietary diversity in mothers/primary caregivers living in informal housing and associated poor socio-economic characteristics, indicating that interventions should include nutrition education to promote dietary diversity as well as programmes that address the socio-economic situation of households.

Recently the SANHANES-1[13] found that 32.4% of participants who experienced food insecurity in the form of hunger lived in urban informal households and 37% in rural formal areas. The two living areas where this study took place are semi-urban formal areas, consisting of formal and informal type of housing, the descriptor used for households in this study and a similar prevalence of food insecure households was found. The SANHANES-1[13] study reported that nationally 51 % of rural formal households vs. 30% of rural informal households were food secure, and 57.9% of all households in the Western Cape Province were food secure.

The CNSP project was executed in the Western Cape and found a higher prevalence of food secure households than SANHANES-1. However it should be noted that SANHANES-1 used the Community Childhood Hunger Identification Project (CCHIP) index[43], also previously used in the National Food Consumption Survey, to measure food insecurity and not the HFIAS. The CCHIP index[43] is an internationally used and validated tool, consisting of eight occurrence questions that represent a generally increasing level of severity of food insecurity (access), and nine frequency-of-occurrence questions. The methodology to calculate the CCHIP index[43] differs from that of the HFIAS, making direct comparison of results impossible.

Aliber analysed the General Household Survey and Income and Expenditure data of Statistics SA and found comparatively large proportions of households who experienced hunger are concentrated in the metro areas. In Ailber's report the prevalence of hunger was higher amongst the households living in informal dwellings. He found 28% of seriously hunger households lived in informal dwellings, where the informal dwellings made out 13 % of the total number of households.[44] Irrespective of the tool used to measure food security it obvious that food insecurity is a bigger problem in informal households.

There is a need for nutrition promotion and education to provide the necessary knowledge and skills to improve dietary intake thereby addressing the poor dietary quality and poor dietary intake in SA. This need was also identified in other studies,[24,40] and other interventions addressing the socio-economic and environmental factors that influence households ability to access an adequate diet. With the planning of nutrition promotion it is important to consider that individual and group counselling combined is more effective than individual or group counselling alone.[45]

The monthly income in households varied widely, and there is possibility that not all households could afford a healthy, diversified diet. There are also other factors that influence households decision-making regarding their diet, including advertising of processed foods, easy access to fruit and vegetables and these aspects also need to be included in intervention programmes. Schönfeldt recently showed that the food price

inflation experienced in SA potentially limits poor households' ability to consume a varied diet as proposed in the SA Food-based Dietary Guidelines.[46]

The level of food security found in this study was higher than the national data reported by SANHANES-1, but it is important to remember that the food security at household level situation can differ within specific communities. This is shown by the results of this study, where households living in formal houses had a higher probability of household food security than those in informal dwellings.

The SANHANES-1 study reported that the majority of participants were in the income group earning between R801 and R3 200 per month. This study found a similar situation with the majority of participants in the income group earning between R1 001 and R3 000 per month, with 17% of formal households and 25% of informal households earning no income or less that R1 000 per month. These findings regarding lack of household income indicates that there is risk for food insecurity in formal and informal households, but the risk was higher amongst informal households, as found by the NFCS[12] and SANHANES-1.[13] The results of the reported household income below R1 000 per month in about 19% of all households is important in relation to food security as it directly prevents the households access to food. Although household income information is not necessarily always reliable, the significant correlation between HHAI and household income confirms that there is a problem in some households related to their socio-economic situation.

It is known that household food security is a pre-requisite for optimal health and well-being. Food security has three dimensions, namely availability, access and utilisation. In the two communities where this study was conducted there are supermarkets, spaza shops and fruit and vegetable vendors within walking distance from the households, therefore food availability was not a problem, but the households access, a pre-requisite for the utilisation of an adequate diet was found to be a real problem. Furthermore, the level of food insecurity was higher in informal households, where poverty was a bigger problem and this was confirmed by the HFIAS and DDS scores, the HFIAS access-related domains findings, the household income and the household asset score. The relationships between household food security, dietary diversity, household monthly income and household socio-economic situation were similar to findings in other studies in SA.[4,12,13,21-24,30,40] Furthermore, there were similarities between the determinants of undernutrition in children in this study, and those found in smaller studies elsewhere and in national surveys in SA. This indicates the urgent need for the SA government to continue addressing both the underlying and the basic causes of malnutrition, whilst simultaneously including challenges associated with the nutrition transition, indicated by the high levels of overweight and poor dietary diversity also shown in this study.

Poverty is characterised by severe deprivation of basic human needs and includes food and nutrition, safe drinking water, sanitation facilities, health care, shelter, education and information. In this study the poverty and food insecurity was found in both formal and informal households, but the extent of household food insecurity was worse in informal households. It is positive that the National Development Plan (NDP)[47] released by the SA government in August 2012 mentions that it drew heavily on the 2008 World Health Organisation Commission on Social Determinants of Health report[48] when setting up priority actions. Furthermore, the NDP lists "direct and immediate measures to attack poverty" which include:

- "Strengthen[ing] primary health-care services and broaden[ing] district-based health programmes, such as the community health worker and midwife programmes, and health education.
- Introduc[ing]e a nutrition programme for pregnant women and young children and extend[ing] early childhood development services for children under five."

These direct health and nutrition interventions address the underlying determinants of malnutrition. Other actions included in the NDP addresses the basic causes of malnutrition relating to human, economic and organizational resources. The high levels of stunting in children and obesity in women in poor households and socio-economic circumstances in this study, also indicated how important it is for the South African government to strengthen the relevant actions included in the Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa, 2012-2016,[33] which promote maternal and infant and young child nutrition. There is also a need to embrace the six objective of the 2008-2013 Action Plan for the Global Strategy for the Prevention and Control of Non-communicable Diseases.[37] The CNSP team need to consider the objectives of the WHO Global Action Plan for the Prevention and Control of Non-communicable diseases 2013–2020[37] and the WHO Population-based approaches to childhood obesity prevention.

3.7 Strengths and limitations

The strength of this study is that a wide-ranging selection of factors were included which give a very extensive understanding of conditions that influence household food security and child nutritional status. The results of the study support the findings of previous studies in others regions of SA as well as national studies. Furthermore, the process that was followed to train and include residents from the two communities as fieldworkers has already built a relationship between the CNSP team and the communities of Avian Park and Zweletema, which should benefit the planning and implementation of intervention activities.

Possible limitations of the study are that the set of questionnaires were extensive and during data collection fieldworkers spent at least two hours at each household. There is a possibility that the collection of data was tiresome for the participants. Furthermore, recall bias on the side of participants is always present and unavoidable. The fieldworkers were trained to conduct the data collection interview in an objective manner but it is possible that interviewer bias could have occurred. This can be seen in the interpretation problem experienced with the LPI by participants. The other possibility is that the question was not asked exactly in the way it is worded in the questionnaire as is evident from the results of the LPI where differences were found to the answers to control questions.

3.8 Conclusion

This study found a high prevalence of stunting amongst children, 0 to 36 months old, and overweight amongst the women who are the mothers/primary caregivers of these children. It also found household food insecurity in the form of poor dietary diversity, insufficient food quality and intake. Families living in informal housing were less food secure and the dietary diversity of mothers/primary caregivers, in these households were also poorer than those living in formal households. The household income in informal households was lower than in formal households, and this was reflected in their household assets. There was a high prevalence of overweight mothers/primary caregivers in the total study population and a relationship existed between BMI of mothers/primary caregivers and housing. Mothers' BMI, food security and DDS increased as household income and assets increased. Since the Division of Human Nutrition and the CNSP team are committed to improve the nutrition security in these communities the results of this study implies that intervention should include both formal and informal households. The improvement of dietary diversity also needs to be a priority when planning intervention, taking into consideration that this may be more difficult to be achieved in informal households due to lower household income.

3.9 Recommendations

The results of this study endorse the recommendations of previous studies in SA, that there is an urgent need to include strategies that improve dietary diversity in nutrition intervention programmes. The CNSP team should engage with role players in the community and community leaders to develop programmes that include interventions that will assist in improving dietary diversity and reduce the modifiable risk factors for non-communicable diseases in Avian Park and Zweletemba.

This could include engaging with the leadership involved at schools and teachers in charge to establish partnerships and collaboration to create an awareness of, and

establish activities mentioned in the WHO documents: Global Strategy on Diet, Physical Activity and Health[38] and Population-based approaches to childhood obesity prevention.[39] The possibility of promoting the establishment of household vegetable gardens needs to be investigated, since it could assist with increasing dietary diversity and serve as a tool for nutrition education. During the data collection period quite a few vegetable gardens were noticed. These programmes should include nutrition promotion and education and focus on improvement of people's knowledge and skills regarding the importance of increasing their dietary diversity to achieve nutrition security and enhance their well-being.[49] The presence of under-nutrition in children, combined with overweight in women need to be taken into consideration in the planning of intervention to improve the household food security situation in Avian Park and Zweletemba. [49] The SA Food-based Dietary Guidelines[50] were introduced in 2001, but it has not been assessed to what extent these guidelines have been embraced by all South Africans in their diets. The establishment and promotion of community based as well as household fruit and vegetable gardens are short-term interventions that need to be considered in Avian Park and Zweletemba, especially in light of the fact that there are many families with incomes below R1 000 per month and who are probably unemployed.

The community needs to be motivated and encouraged to use the current health-facility based intervention programmes to prevent stunting in children younger than 2 years old. These programmes include the Mother Baby Friendly Initiative, Integrated Management of Childhood Illnesses and the Nutrition Therapeutic Programme[32,33] to ensure the optimal implementation of the new Road to Health booklet[32] and the promotion of infant and young child growth. There is also a need for intervention programmes that include behaviour change that supports a healthy lifestyle; including regular activity and a healthy diet. The promotion of the SA Food-based Dietary Guidelines[50] is not necessarily the most suitable intervention, since Schönfeldt has questioned the relevance of food-based dietary guidelines in circumstances where financial means limit food choice.[51]

3.10 References

1. UNICEF. (1990) Strategy for Improved Nutrition of Children and Women in Developing Countries. New York: UNICEF. [Online] w.ceecis.org/iodine/01_global/01_pl/01_01_other_1992_unicef.pdf [2012, 3 August]
2. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet: Published Online June 6, 2013 [Online] http://dx.doi.org/10.1016/S0140-6736(13)60937-X. [2013, 8 June]

3. The Global Food Security Index 2013: An annual measure of the state of global food security. The Economist Intelligence Unit Limited 2013. [Online] http://foodsecurityindex.eiu.com/[2013, 6 July]
4. The National Food Consumption Survey: Fortification Baseline (NFCS-FB-1), 2005. The knowledge, attitude, behaviour and procurement regarding fortified foods, a measure of hunger and the anthropometric and selected micronutrient status of children aged 1- 9 years and women of child bearing age. Directorate: Nutrition, Department of Health, South Africa. 2007.
5. Mattes R. (2008) The material and political bases of lived poverty in Africa: Insights from the Afrobarometer. CSSR Working paper 216, May 2008. Centre for Social Science research. [Online] http://www.cssr.uct.ac.za/publications/working-paper/2008/material-and-political-bases-lived-poverty [2013, 5 June]
6. Battersby J. (2011) The State of Urban Food Insecurity in Cape Town. Urban Food Security Series, No. 11. Queen's University and AFSUN: Kingston and Cape Town. [Online] http://queensu.ca/samp/afsun/files/AFSUN_11.pdf [2013, 5 June]
7. Frayne B, Pendleton W, Crush J, et al. (2010) The State of Urban Food Insecurity in Southern Africa. Urban Food Security Series No. 2. Queen's University and AFSUN: Kingston and Cape Town. [Online] http://www.academia.edu/904314/The_State_of_Urban_Food_Insecurity_in_Southern_Africa_2010 [2013, 7 July]
8. Davids YD. (2010) Explaining poverty: a comparison between perceptions and conditions of poverty in South Africa. PhD thesis. Stellenbosch University.
9. Filmer D, Pritchett L. (1998) Estimating wealth effects without expenditure data- or tears: an application to educational enrollments in states in India. Policy research working paper 1994. [Online] http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/1998/11/17/000178830_98111703524522/Rendered/PDF/multi_page.pdf [2013, 5 June]
10. Swindale A, Bilinsky P. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guidelines for measuring household and individual dietary diversity. Version 2 (2006) Food and Nutrition Technical Assistance III Project (FANTA) [Online] http://www.fantaproject.org/sites/default/files/resources/HDDS_v2_Sep06_0.pdf [2013, 25 October]
11. Coates J, Swindale A, Bilinsky P. Household Food Insecurity Access Scale (HFIAS) for Measurement of Food Access: Indicator Guide. Version 3 (2007) [Online] http://www.fantaproject.org/downloads/pdfs/HFIAS_v3_Aug07.pdf [2012, 14 April]

12. Steyn NP, Labadarios D, Maunder E, et al. Secondary anthropometric data analysis of the national food consumption surveys in South Africa: The double burden. Nutrition 2005;21(1):4-13 [2013, 3 October]
13. Shisana O, Labadarios D, Rehle T, et al. & SANHANES-1 Team (2013) South African National Health and Nutrition Examination Survey (SANHANES-1). Cape Town: HSRC Press. [Online] http://www.hsrc.ac.za/en/media-briefs/population-health/results-sanhanes1 [2013, 1 September]
14. McLachlan MH, Balogun T, Bekkers N, Du Plessis LM, Goosen C, Herselman MG, Koen N, Koornhof HE, Lombard MJ, Marais ML, Minnaar JA, Roos J, Slamong N, Visser J. A Community Nutrition Security Research Project in the Breede Valley, Western Cape Province, South Africa – baseline study. Final research protocol, 10 February 2011. Approved by the Human Research Committee of the Faculty of Health Sciences, Stellenbosch University Ethics Committee (N10/11/368).
15. Field work manual, 2011. Quantative Research phase of the Community Nutrition Security Research Project in the Breede Valley, Western Cape Province, South Africa – baseline study.
16. Physical status: the use and interpretation of anthropometry. (1995) Report of a WHO Expert Committee. Technical Report Series No. 854 [Online] http://www.who.int/childgrowth/publications/physical_status/en/index.html [2013, 30 October]
17. Cogill B. (2003) Anthropometric Indicators Measurement Guide. Food and Nutrition Technical Assistance Project, Academy for Educational Development, Washington, D.C., Revised Edition. [Online] http://www.fantaproject.org/publications/anthropom.shtml [2013, 1 September]
18. Obesity: preventing and managing the global epidemic: report of a WHO consultation. Technical Report Series No. 894 (1999) [Online] http://whqlibdoc.who.int/trs/WHO_TRS_894.pdf [2013, 6 September]
19. De Onis M (ed), et al. (2006) WHO child growth standards : length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age : methods and development [Online] http://www.who.int/childgrowth/standards/Technical_report.pdf [2013, 6 September]
20. Hatloy A, Torheim LE, Oshuag A. Food variety- a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. European Journal of Clinical Nutrition 1998;52:891-898 [Online] http://www.ncbi.nlm.nih.gov/pubmed/9881884 [2013, 4 November]
21. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household security indicators. International Journal of Food Safety, Nutrition and Public Health

2009;2(1):137-177 [Online] http://www.hsrc.ac.za/Research_Publication-20348.phtml [2012, 1 October]

22. Labadarios D, Mchiza ZJ, Steyn NP, et al. Food security in South Africa: a review of national surveys. (2011). Bulletin of the World Health Organization 89:891-899. [Online] http://www.who.int/bulletin/volumes/89/12/11-089243/en/ [2013, 4 November]
23. Oldewage-Theron W & Kruger R. Dietary diversity and adequacy of women caregivers in a peri-urban informal settlement in South Africa. Nutrition2011;27:420-427 [Online] http://www.ncbi.nlm.nih.gov/pubmed/20688475 [2013, 4 November]
24. Steyn NP, Nel JH, Nantel G, et al. Food variety and dietary diversity scores in children: Are they good indicators of dietary adequacy. Public Health Nutrition 2006;9(5):644-650 [Online] DOI: 10.1079/PHN2005912 [2013, 6 September]
25. StatSoft, Inc. (2013). Electronic Statistics Textbook. Tulsa, OK: StatSoft. [Online] http://www.statsoft.com/textbook/. [2014, 6 February]
26. WHO Anthro for personal computers, version 3.2.2. (2011) Software for assessing growth and development of the world's children. Geneva: WHO [Online] http://www.who.int/childgrowth/software/en/ [2013, 5 June]
27. Waist circumference and waist–hip ratio: report of a WHO expert consultation, Geneva, 8–11 December 2008. [Online] http://www.who.int/nutrition/publications/obesity/WHO_report_waistcircumference_and_waisthip_ratio/en/index.html [2013, 2 October]
28. Kruger HS, Steyn NP, Swart EC, et al. Overweight among children decreased, but obesity prevalence remained high among women in South Africa, 1999-2005. Public Health Nutrition 2012;15(4):594-599 [Online] http://www.ncbi.nlm.nih.gov/pubmed/22005093 [2013, 6 September]
29. Breede valley Municipality. Integrated development plan 2007 - 2011. 2007: 1-248
30. Kimani-Murage EW, Kahn K, Pettifor JM, et al. (2010) The prevalence of stunting, overweight and obesity, and metabolic disease risk in rural South African children. BMC Public Health 2010; 10:158 [Online] http://www.biomedcentral.com/content/pdf/1471-2458-10-158.pdf [2013, 29 August]
31. Labadarios D (editor), Steyn NP, Maunder E, et al. The National Food Consumption Survey (NFCS): children aged 1–9 years, South Africa, 1999. Pretoria: Department of Health; 2000. [0nline] DOI: 10.1079/PHN2005816 [2013, 6 September]
32. Victora CG, Adair L, Fall C, et al. Maternal and child undernutrition: consequences for adult health and human capital. Lancet 2008;371:340–357 [Online] http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616924 [2012, 23 July]

33. Department of Health. 2012. Roadmap for Nutrition in South Africa for 2012-2016. Final Draft. Pretoria, South Africa.
34. Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa. 2012 – 2016 [Online] http://www.doh.gov.za/docs/stratdocs/2012/MNCWHstratplan.pdf [2013, 19 October]
35. Case A, Menendez A. Sex differences in obesity rates in poor countries: Evidence from South Africa. Economics and Human Biology 2009;(7):271–282 [Online] http://www.ncbi.nlm.nih.gov/pmc/articles/PMC2767444/ [2013, 2 November]
36. Smuts CM, Faber M, Schoeman SE, et al. Socio-demographic factors and anthropometric status of 0-71-month-old children and their caregivers in rural districts of the Eastern Cape and KwaZulu-Natal provinces of South Africa. South African Journal of Clinical Nutrition 2008;21(3):117-125 [Online] http://www.sajcn.com/index.php/SAJCN/article/view/200 [2013, 6 September]
37. WH 66.10/ World Health Assembly, 27 May 2013. Follow-up to the Political Declaration of the High-level Meeting of the General Assembly on the Prevention and Control of Non-communicable Diseases. Sixty-sixth World Health Assembly. [Online] http://apps.who.int/gb/ebwha/pdf_files/WHA66/A66_R10-en.pdf [2013, 2 November]
38. 2008-2013 Action plan for the global strategy for the prevention and control of noncommunicable diseases [Online] http://www.who.int/nmh/publications/9789241597418/en/index.html [2013, 2 November]
39. World Health Organisation Global Strategy on Diet, Physical Activity and Health.(2004) [Online] http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf [2013, 2 November]
40. Population-based approaches to childhood obesity prevention. (2012) [Online] http://apps.who.int/iris/bitstream/10665/80149/1/9789241504782_eng.pdf [2013, 2 November]
41. Labadarios D, Steyn N, Nel JH. How diverse is the diet of adult South Africans? Nutrition Journal 2011;10:33 [Online] http://www.nutritionj.com.ez.sun.ac.za/content/10/1/33 [2013, 1 October]
42. Headey D, Ecker O. Rethinking the measurement of food security: from first principles to best practice. Food Security (2013)5:327–343 [Online] DOI: 10.1007/s12571-013-0253-0 [2013, 1 September]
43. Ruel, M.T. Operationalizing dietary diversity: a review of measurement issues and research Priorities. Journal of Nutrition 2003;133:*S*3911-*S*3926 [Online] http://jn.nutrition.org/content/133/11/3911S.full.pdf+html [2013, 6 September]

44. Wehler CA, Stott RI, Anderson JJ. The Community Childhood Hunger Identification Project: A Model of Domestic Hunger-Demonstration Project in Seattle, Washington. Journal of Nutrition Education 1992;24(1):29*S*-35*S*
45. Aliber M. Exploring Statistics South Africa's national household surveys as sources about household-level food security. Agrekon 2009;48:384–409
46. Bhutta ZA, Das JK, Rizvi A, Gaffey MF, Walker N, Horton S, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? Lancet: Published Online June 6, 2013 [Online] doi:10.1016/S0140-6736(08)61345-8 [2013, 24 June]
47. Schönfeldt HC, Gibson N, Vermeulen H. The possible impact of inflation on nutritionally vulnerable households in a developing country using South Africa as a case study. Nutrition Bulletin 2010:35; 253-266
48. National Development Plan 2030 Our Future-make it work. (2012) [Online] http://www.npconline.co.za/MediaLib/Downloads/Downloads/Executive%20Summary-NDP%202030%20-%20Our%20future%20-%20make%20it%20work.pdf [2013, 26 October]
49. Commission on Social Determinants of Health. (2008) Closing the gap in a generation: health equity through action on the social determinants of health. Final Report of the Commission on Social Determinants of Health. Geneva, World Health Organization. [Online] http://whqlibdoc.who.int/publications/2008/9789241563703_eng.pdf [2013, 1 September]
50. Food and Agriculture Organization. Agriculture, food and nutrition for Africa - A resource book for teachers of agriculture. Rome, FAO, 1997.
51. South African Food-Based Dietary Guidelines. South African Journal of Clinical Nutrition 2001;14(3):S1-S80 [Online] http://www.sahealthinfo.org/nutrition/safoodbased.htm [2013, 1 September]
52. Schönfeldt HC, Hall N, Bester M. Relevance of food-based dietary guidelines to food and nutrition security: A South African perspective. Nutrition Bulletin 2013; 38: 226-235 [Online] http://onlinelibrary.wiley.com.ez.sun.ac.za/doi/10.1111/nbu.12027/pdf [2013, 16 November]

CHAPTER 4

HOUSEHOLD CHARACTERISTICS AND ANTHROPOMETRIC STATUS OF RECIPIENTS OF THE CHILD SUPPORT GRANT IN AVIAN PARK AND ZWELETEMBA

(To be submitted to Maternal & Child Nutrition)

4.1 Abstract

Objective: To compare households receiving a child support grant (CSG) with those without regarding anthropometric status of the mothers/primary caregivers (PCGs), their dietary diversity, relevant socio-demographic factors, food security and anthropometric status of their children.

Design: Cross sectional, descriptive study

Setting: Randomly selected households in Avian Park (n=211) and Zweletemba (n=242) in Worcester, South Africa.

Subjects: Children, 0 – 36 months old; their mothers/ PCGs.

Methods: Data collected by questionnaire included socio-demographic data, Household Food Insecurity Access Scale (HFIAS) and dietary diversity score (DDS). Anthropometric measurements included weight, height plus waist circumference of mothers/ PCGs and mid-upper-arm circumference of children. Households receiving CSGs and without CSG were compared using a X^2-test or t-test.

Results: Age, marital status, education level and employment status of mothers/PCGs in CSG households and non-CSG households were similar. Household size was larger ($p<0.0001$) in CSG (n = 5) versus non-CSG households (n = 4); CSG households had more people per room (2.7 [SD 1.5] versus 2.3 [SD 1.2]; p=0.0037). CSG households had lower monthly income than non-CSG households (R2 723 [SD R3 297] versus R4 520 [SD R6 464]; p=0.0033). HFIAS scores showed more food insecurity (p = 0.0178) in CSG households than non-CSG (3.55 vs. 2.37; p= 0.0178), but dietary diversity was similar. Stunting was more in CSG (34.9%) vs. non-CSG (22.7%) children. CSG mothers/PCGs had larger (p = 0.021) waist circumferences (90.0 cm; SD = 16.8) than non-CSG mother/PCGs (88.5 cm; SD = 16.5).

Conclusions: Monthly household income in CSG household was less despite receiving the CSG. More than 50% of all households consumed a diet of low variety (DDS ≤ 4) indicating inadequate dietary intake. Household food insecurity and stunting in children was more in CSG households.

4.2 Introduction

Nutrition is important throughout the lifespan of all human beings and a requirement for good health and well-being. Globally, and in South Africa (SA), child undernutrition is a major problem. The first Millennium Development Goal is to *eradicate extreme poverty and hunger*,[1] and its achievement is crucial in SA for national progress and

development. The 2009 World Summit on Food Security[2] adopted the Five Rome Principles for Sustainable Global Food Security as guidelines for action to fully realize the one of targets of MDG 1, namely to reduce the proportion and the number of people who suffer from hunger and malnutrition by half by 2015. SA, a member state of the United Nations and signatory of the Millennium Declaration, is dedicated to achieve the MDGs.[3] The third Rome Principle proposes the inclusive approach to achieve food security that includes both direct action to immediately tackle hunger for the most vulnerable, and medium and long-term sustainable agricultural, food security, nutrition and rural development programmes to eliminate the root causes of hunger and poverty.[2]

The role of social security, in the form of conditional cash transfers and safety nets, to improve mother and child nutrition, is stated in a review of evidence-based interventions, as it can assist families to deal with their financial constraints and increase their access to health care and proper nutrition.[4] In SA the child support grant (CSG) is issued to more than 10 million children and aims to address poverty and reduce the vulnerability of children as members of poor families.[5] The CSG is provided to mothers and primary caregivers who meet the qualifying requirements set out in a means test. Currently the asset and income threshold to qualify for a CSG is R3 600 per month for a single person and R7 200 per month for a married person; and the monthly amount of the CSG is R300.[6] The CSG in SA complies with the definition of nutrition sensitive interventions or programmes given by Ruel[7] in the 2013 Lancet Series. According to Ruel nutrition-sensitive interventions and programmes are "Interventions or programmes that address the underlying determinants of foetal and child nutrition and development - food security; adequate caregiving resources at the maternal, household and community levels; and access to health services and a safe and hygienic environment - and incorporate specific nutrition goals and actions."[7]

A 2013 United Nations Childrens Fund report states that there is less evidence for the impact of nutrition-sensitive approaches than for direct nutrition-specific interventions, because they are difficult to measure, however these policies that influence agriculture, education, social protection and poverty alleviation are vital for achieving nutrition goals.[8] In SA, primary health care services, and primary and secondary education are provided free of charge, and consequently it is possible to assume that the CSG will boost household food security. Ruel states that nutrition-sensitive programmes have the potential to enhance nutrition specific programs as they impact on nutrition through enhancing the household and community environment in which children develop and grow.[7] Agüero et al. used the KwaZulu-Natal Income Dynamics study data to compare

the height for age (H/A) of children younger than 36 months who have been receiving the CSG for different periods of time i.e. for one, two or three years. They reported a positive impact on the H/A in the group of children who had received the CSG from a younger age, and concluded that the extent of the impact of the CSG was lower when the grant was introduced at a later age. Agüero et al. concluded that the CSG advanced childhood nutrition.[9] An economic analysis by Coetzee in 2011 found that some of the cash that caregivers receive via the CSG appeared to be spent on improving the welfare of children, consequently having a positive influence on their health, nutrition and education.[10] There is a paucity of studies reporting household food security status of CSG recipients, and whether the CSG actually improves nutrition security. According to the 2012 National Development Plan for SA,[11] the aim of social protection is to address inequality and poverty, by supporting those in need to afford them a basic standard of living.

This study formed part of the Community-Based Nutrition Security Project (CNSP)[12] in the Breede Valley in the Western Cape Province, SA. The paper "Household food and nutrition security in Avian Park and Zweletemba"[13] compared the food and nutrition situation of children under three years old and their mothers/primary caregivers who live in formal and informal houses. Dietary diversity, as well as household food security, as measured by the household food insecurity access scale (HFIAS) was higher for mothers/primary caregivers living in formal households. The mothers/primary caregivers' DDS was inversely correlated with HFIAS score, indicating a poorer nutritional quality of the diet for food insecure mothers/primary caregivers. Formal households had a higher monthly income and better socio-economic situation than informal households. Formal households consumed a more varied diet and experienced less household food insecurity. Household food security was associated with higher monthly household incomes, more household assets and better socio-economic conditions.

The level of stunting prevalent in children under three years old in Avian Park and Zweletemba was high (31.2%).[13] The conclusions of the 2008 and 2013 Lancet Series papers that stunted children are susceptible to become short adults, have poorer learning achievement, have smaller offspring and a poorer economic ability in adulthood[14,15] underscores the need to assess whether the CSG, an nutrition sensitive programme in SA, promotes and supports household food and nutrition security of households within this community, and to identify whether there is a need for additional nutrition intervention to enhance the nutritional status of young children.

4.3 Methods and materials

4.3.1 Study population

This is the second paper reporting findings of a secondary analysis of data from the CNSP[12] in the Breede Valley in the Western Cape Province, SA. The study population and methodology were discussed in the first article.[13] The CNSP baseline study was conducted according to the guidelines laid down in the Declaration of Helsinki and all procedures involving human subjects/patients were approved by the Stellenbosch University Health Research Ethics Committee (Ethics Reference N10/11/368).[12] Written consent was obtained from all participants and ethics approval for the secondary analysis was granted by Stellenbosch University Health Research Ethics Committee (S13/05/097).

The total study population of 453 households included 211 and 242 households in Avian Park and Zweletemba respectively. The determinants of household food security of mothers/primary caregivers and their children, 0 - 36 months old were explored in relation to the CSG.

4.3.2 Questionnaires

The data collection process was described in "Household food and nutrition security in Avian Park and Zweletemba."[13] The secondary analysis includes selected data from the CNSP socio-demographic questionnaire, the HFIAS[16], and dietary diversity questionnaire[17] for the mother/primary caregivers. The socio-demographic questionnaire included questions regarding the number of people in the household, type of dwelling, monthly household income, sources of income including different grants received, the number of rooms per house and the number of people sharing a room, education levels attained, current employment status and the availability of basic and convenience assets in the household.

4.3.3 Anthropometry

The anthropometric data of the mothers and children were collected according to World Health Organization (WHO) standard procedures.[18,19] Measurements included height or length, weight, and mid-upper arm circumference (MUAC) of children aged 0-36 months old; and the weight, height and waist circumference (WC) of mothers/primary caregivers. The anthropometric data of children were captured and analysed with WHO Anthro (version 3.2.2, January 2011) software.[20]

4.3.4 Individual Diet Diversity scores

The field workers did a 24 hour recall with all the mothers/primary caregivers their food intake and information collected were used to fill out the dietary diversity questionnaire[17] and determine the dietary diversity scores (DDS) as indicator of the nutritional quality of

the diet. The method described by Hatloy et al.[21] of using nine food groups were used to determine the dietary diversity score. in other studies in SA Faber et al.,[22] Labadarios et al.[23] and Oldewage-Theron et al.[24] have also this method. This method uses the following nine food groups: (1) cereals, grains and roots; (2) vitamin A-rich fruit and vegetables; (3) fruit other than vitamin A-rich; (4) vegetables other than vitamin A-rich; (5) meat, poultry and fish; (6) eggs; (7) legumes, nuts and seeds; (8) dairy products and (9) oils and fats. Sugars and beverages do not add to the nutritional quality of the diet and were therfore excluded when calculating the DDS.. The lowest potential DDS is zero and maximum is nine. A DDS below four is regarded as poor dietary diversity.[25]

4.3.5 Household food insecurity access scale (HFIAS)

The HFIAS[17] which evaluates respondents' feelings and perceptions regarding the access domains of food insecurity included nine questions to estimate the prevalence of household food insecurity. This instrument has been validated in diverse settings and is simple to use and analyse, and captures the human aspects of food insecurity. Participants were asked to reflect whether in the past 30 days any of the nine food insecurity related conditions had transpired and the occurrence of positive answers were recorded as: rarely (once or twice); sometimes (3 to 10 times) or often (more than 10 times), over the past 30 days. A value is given to each response per condition ("never" is 0; "rarely" is 1; "sometimes" is 2 and "often" is 3) and the HFIAS score was determined by adding the values of the answers for the nine food insecurity related conditions. The maximum score was 27, when often was the reply for all nine conditions, and the lowest score was zero, where never was the reply to all nine conditions. The higher the score, the more food insecurity the household had experienced in terms of food access. The nine questions regarding the different conditions in the HFIAS were grouped in three domains, namely, 1) *anxiety and uncertainty about household food supply; 2) insufficient food quality and* 3) i*nsufficient food intake and its physical consequences,* consequently it is also possible to report prevalence of food insecurity in these terms.

4.3.6 Household Asset Index

This index was devised and validated by Filmer and Pritchard[26] as a method to assess household socio-economic status without collecting data on household income. It is also a proxy for household income[27], as participants are sometimes not sure what the household income is or unwilling to give correct information for personal reasons. Factor and principal component analysis was used to construct the household asset index from variables included in the socio-demographic questionnaire. The following variables were used to construct the household asset index: type of house/dwelling;

number of people in house; number of rooms in house excluding bathroom toilet and kitchen if separate; no of people per room; drinking water in house; flush toilet; fuel available for cooking; working refrigerator/ freezer; stove: electric/gas/coal; primus or paraffin stove; micro-wave oven; electrical hotplate; radio or television; telephone: landline or cellular.

4.4 Data analysis

Data collected was captured in Microsoft Excel and WHO Anthro (version 3.2.2) and analysed with SAS 9.3 (2002-2010), SAS Institute Inc. Cary, NC, USA. Height and weight of mothers/primary caregivers were used to calculate body mass index (BMI), which is the ratio of weight (in kg) to height (in m^2). Participants were classified according to the WHO body size classifications as underweight (BMI<18.5 kg/m^2), normal weight (BMI = 18.5 to 24.99 kg/m^2), overweight (BMI = 25 to 29.99 kg/m^2) or obese (BMI > or = to 30 kg/m^2). WC of respectively, equal and above 80 cm and 88 cm was regarded as increased risk and substantially increased risk for chronic diseases of lifestyle.[18,27,28] Children's age, weight and height were used to calculate weight-for-age Z-scores (WAZ), BMI-for-age Z-scores (BAZ) and height-for-age Z-scores (HAZ), weight-for-height Z-scores (WHZ). The data was interpreted with WHO child growth standards and cut-off values.[29] Underweight is defined as WAZ more than two standard deviations (SD) below the median of the reference population; stunted as HAZ more than two SD below the median of the reference population; wasted as WHZ more than two SD below the median of the reference population and overweight as BAZ more than two SD above the median of the reference population.[29] MUAC below 11.0 cm was used for screening severely malnourished children; and 11–12.5 cm as classification of moderate or severe malnutrition, depending on the presence of oedema or not.[18,30] Data were described using means, standard deviations and percentages. Households were grouped according to whether they received a CSG. Households receiving a CSG (CSG households) and those not receiving a CSG (non-CSG households) were compared using the chi-square test for categorical data and the independent t-test for continuous data. Level of significance was set at 0.05.

4.5 Results

Of the 453 sampled households, nearly all (97%, n=441) received at least one grant, however not necessarily a CSG, from the South African Department of Social Development. Sixty nine percent (n=312) of all households received one or more CSG, and 5.3% and 16.4% of households received disability grants and old age pensions respectively. There were 115 children younger than 6 months old in the study and of

them 61% (n = 70) were already receiving a CSG. At the time of data collection 3% (n=15) of households were receiving social relief in distress, which is a temporary provision of assistance intended for persons in such dire material need that they are unable to meet their, or their families', most basic needs.[6] Five households received a foster care grant, paid to a person who was granted foster care status by a court order.[6] The mean monthly income of all households was R3 252 (SD R4 535). The reported household income also included the income from social grants, including the CSG. There was a significant difference (Independent t-test, p=0.0033) in the mean monthly household income of CSG households (R2 723; SD R3 298) vs. non-CSG households (R4 520; SD R6 464). The median monthly household income of CSG households was R2 060 and that of non-CSG households was R2 695. A Wilcoxon Rank Sum Test to compare the locations of monthly income of the group of households receiving a CSG and the group without a CSG indicated a significant difference between the monthly income of the two respective groups (p-value is <0.0001). The median monthly household income of CSG households was below the means test threshold to qualify for the CSG, which was R2 600 for a single caregiver, and R5 200 for a married caregiver plus spouse[31] at the time of data collection. A question regarding whether the household qualifies or not to receive the CSG was not included in the socio-demographic questionnaire, therefore it is not possible to report precisely how many households actually qualified to receive the CSG, but when considering the finding regarding monthly household income of CSG households, it is possible to speculate that CSG households most probably qualified to receive the CSG.

The socio-demographic characteristics of mothers/primary caregivers and their households are shown in Table 4.1. The age of mothers/primary caregivers ranged from 15 to 79 years old, with a median of 47 years. Nine percent of children were being cared for by their grandmothers. The age of 39% of mothers/primary caregivers were above the mean age of 30.5 years, whilst the other 61% were below the mean age; only 9% of mothers/primary caregivers were between 15 and 20 years old. The age of the majority of the mothers/primary caregivers (53%) ranged between 20 and 30 years old. There was no statistically significant difference in the demographic characteristics of recipients and non-recipients of CSGs in terms of mean age, marital status; employment status, level of education obtained, number of grants received or type of dwelling in which they lived. An independent t-test showed a significant difference (p=0.0037) between the number of people sharing a room in CSG households (2.7, SD 1.5) vs. non-CSG households (2.3, SD 1.2), indicating that more people in CSG households were sharing a room than in non-CSG households. A chi-square test showed a significant relationship (p<0.0001) between number of people in the

household and receiving a CSG, meaning that there is probability that CSG households will have more people in the household than non-CSG households, suggesting the size of households receiving a CSG tended to be larger than those without.

Table 4.1: Socio-demographic and economic characteristics of Child Support Grant (CSG) and non-CSG mothers/primary care givers and their households

Categories	**Total CGs** n = 451	**CSG households** n = 312	**Non-CSG households** n = 139	**p-value**
Age of mothers/ primary caregivers age: mean (SD)	30.5 (10.1)	31.0 (9.6)	29.5 (11)	t-test: p = 0.15
Marital status				
Unmarried	45.8	48.6	39.5	
Married	34.9	34.1	36.7	
Divorced	2.0	1.9	2.2	
Separated	1.8	1.3	2.9	X^2-test: p=0.63
Widowed	5.8	5.1	7.2	
Living together	7.3	6.8	8.6	
Traditional marriage	2.2	1.9	2.9	
Status not indicated	0.2	0.3	0.0	
Type of dwelling				
Formal		69.5	72.7	X^2-test: p = 0.50
Informal		30.5	27.3	
No of people in household	n=447	n=308	n=139	
1-2 persons	4.7	3.6	7.2	
3-4 persons	45.9	39.0	61.2	X^2-test: P < 0.0001
5-6 persons	33.1	38.2	21.5	
More than 6 persons	16.3	19.2	10.1	
Employment/work status	n = 441	n = 304	n = 137	
Unemployed & looking for work	60.1	61.5	56.9	X^2-test: p = 0.40
Self-employed/ wage earner/ pension	39.9	38.5	43.1	
Household income categories	**%**	**%**	**%**	
R1-500	10.6	12.7	5.5	
R501-R1000	11.7	13.0	8.6	
R1001-R3000	42.8	43.7	40.6	X^2-test: p=0.0006
R3001-R5000	19.8	19.9	19.5	
Over R5000	15.1	10.7	25.8	
Monthly household income	n=435	n=307	n=128	
Mean total income (SD)	R3,252 (R4,535)	R2,723 (R3,298)	R4,520 (R6,464)	
Median income	Median = R2,260	Median = R2,060	Median= R2,695	t-test: p=0.0033
Minimum income	Minimum = R250	Minimum= R250	Minimum=R300	
Maximum income	Maximum=R60,000	Maximum=R40,260	Maximum=R60,000	
Household size (persons)	4 (2-12)	5 (2-12)	4 (2- 12)	*t-test: p < 0.0001
Number of people per room	2.6 (1.4)	2.7 (1.5)	2.3 (1.2)	*t-test: p = 0.0037
Level of education	n=449	n=310	n=139	
No education	2.5	2.6	2.2	
Primary School	12.0	12.9	10.1	X^2-test: p = 0.104
Grade 8-10	37.9	39.4	34.5	
Grade 11-12	43.9	42.9	46.0	
Tertiary (1 year certificate	3.8	2.3	7.2	
Percentage of households receiving any grant/s	78.99	100	30.9	*X^2 test: p = <.0001

*: p - value < 0.05; CSG = Child Support Grant; Values are expressed percentages or where indicated as mean (standard deviation)

The Household Asset Index (HHAI) is a proxy for long-run household wealth, or lack thereof, and convenient control for household economic status. The better the HH socio-economic situation the higher the HHAI will be. The HHAI of CSG households was – 0.16 (SD 4.26) compared 0.39 (SD 3.84) for non-CSG households. There was no significant difference (t-test: p= 0.18), indicating that the household socio-economic situation in non-CSG were not really better than that of CSG households. The HHIA for the CSG and non-SCG groups were divided into quartiles; the mean HHIA score of the respective groups in each quartile are shown in figure 4.1 and in the figure it is visible that the lowest quartiles of households were the worst off in terms of household assets. Both the CSG and non-CSG groups had a negative HHAI in the lowest quartile showing that the socio-economic situation in CSG and non-CSG households was the worst bottom quartile compared to the positive HHAI of households in the second, third and fourth quartile. Furthermore figure 4.1 shows that the situation in CSG households was worse than in non-CSG households, although not significantly, specifically in the bottom two quartiles, but in the upper two quartiles the situation was nearly the same.

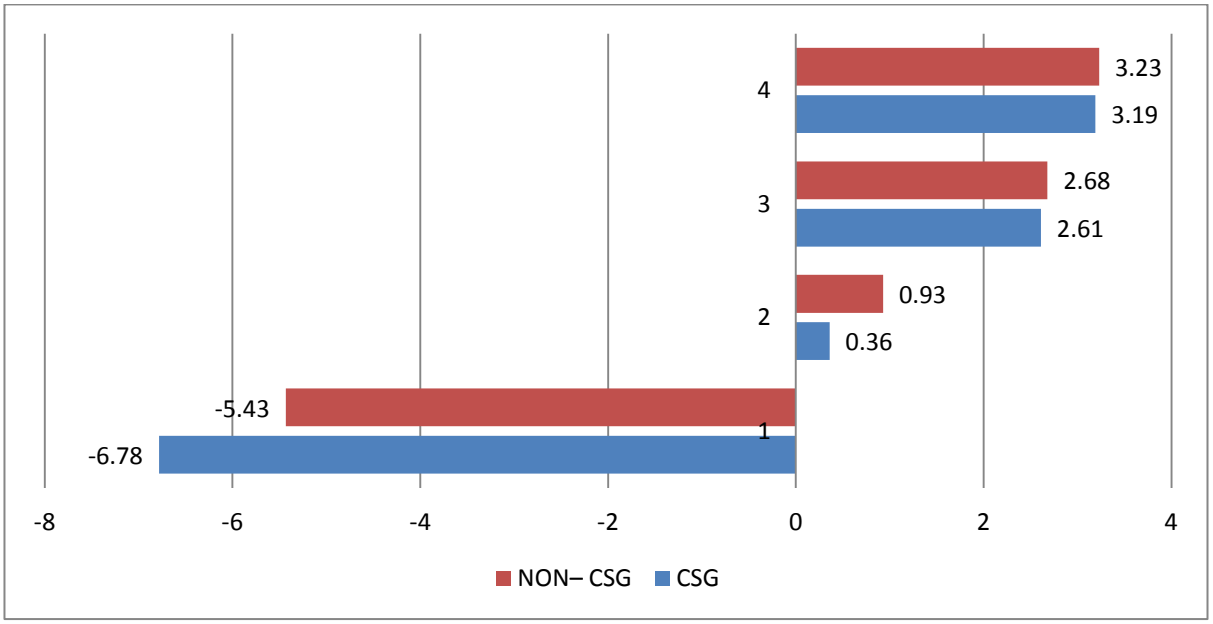

Figure 4.1: Household Asset Index of CSG households and non-Child Support Grant households divided in 4 quartiles

The food security status of households as measured with the HFIAS showed 63.1% of households in the total study population were food secure. There was no significant difference in the household food security status of the CSG households and the non-CSG households. The Household Food Insecurity Prevalence Status Indicator[17] was used to categorise households as 1) *food secure*; 2) *mildly food insecure*; 3) *moderately* and 4) *severely food insecure*. In Table 4.2 the household food security and poverty in the CSG households and non-CSG households were compared in terms of the DDS of

the mothers/primary caregivers, HFIAS measures, monthly household income per category and total monthly income. There was a significant difference between the HFIAS scores of CSG households and non-CSG households (3.55 vs. 2.37; t-test: p= 0.0178), indicating that CSG households experienced more food insecurity than non-CSG households. Furthermore the significant difference in mean monthly income of CSG households versus non-CSG households showed the likelihood of monthly household income in CSG households to be smaller than in non-CSG households. Food security at household level is attainable when a household has the means to purchase food or to produce food for their own use, and therefore the significantly lower (and therefore better) HFIAS score of households with significant higher monthly income is explicable. The difference in the food security situation between CSG households and non-CSG households was evident in the comparison of the households' experience of the three household food insecurity Access-related domains, namely: 1) *Anxiety and uncertainty about household food supply*; 2) *Insufficient food quality* and 3) *Insufficient food intake and its physical consequences*. Table 4.2 shows there were significant differences between CSG households and non-CSG households for each of the three household food security access related domains, suggesting access to an adequate amount of good quality nutritious food during the month was problematic in households receiving the CSG.

Table 4.2: Food security in households using the Household Food Insecurity Access Scale (HFIAS), and the dietary diversity scores of Child Support Grant mothers/primary caregivers and non-Child Support Grant mothers/primary caregivers

	All households n = 451	**CSG households** n = 312	**Non-CSG households** n = 139	**p-value**
Household Food (In) security Status	**%**	**%**	**%**	
Food secure	63.1	59.9	70.5	X^2-test: p = 0.1193
Mildly Food Insecure Access	4.4	4.2	5.0	
Moderately Food Insecure Access	21.7	24.4	15.8	
Severely Food insecure access	10.6	11.5	8.6	
HFIAS Access-related domains	**%**	**%**	**%**	
1. Anxiety and uncertainty about household food supply	32.2	35.9	23.7	$^{\star}X^2$-test: p =0.0107
2. Insufficient food quality	34.2	37.5	26.6	$^{\star}X^2$-test: p=0.024
3. Insufficient food intake and its physical consequences	34.4	37.8	26.6	$^{\star}X^2$-test: p=0.0207
HFIAS score	3.2 (5.2)	3.6 (5.5)	2.4 (4.6)	*t-test: p =0.0178
Dietary Diversity Score: Mother/primary caregiver	**%**	**%**	**%**	X^2-test: p = 0.4894
Dietary Diversity Score 0–4	56.0	54.9	58.4	
Dietary Diversity Score 5–9	44.0	45.1	41.6	
Mean DDS: Mother/primary caregiver	4.4 (1.6) n = 445	4.4 (1.6) n = 308	4.34 (1.72) n = 137	t-test: p =0.6993

CSG=Child Support Grant; Values expressed as mean (standard deviation) or percentages where indicated;
*: p - value < 0.05

There was no significant difference between the DDS of CSG mothers/primary caregivers (4.40; SD 1.55) vs. DDS of non-CSG mothers/primary caregivers (4.34; SD 1.72). Fifty-six percent of mothers/ primary caregivers in the total study population consumed a diet of low variety (DDS ≤ 4) pointing towards an inadequate dietary intake. The percentage of mothers/primary caregivers who consumed a diet of low variety (DDS ≤ 4) was similar for CSG mothers/primary caregivers (54.9%) and non-CSG mothers/primary caregivers (58.4%). This finding indicates that the inadequate dietary quality in terms of variety of food was a problem amongst both CSG mothers/primary caregivers and non-CSG mothers/primary caregivers.

The anthropometric data of the mothers/ primary caregivers and the children aged 0 to 36 months are shown in Table 4.3. The number of participants for whom anthropometric results are reported (n=446) is less than for other variables, since anthropometric measurements were taken of non-pregnant mothers/primary caregivers and anthropometric measurements were not taken of fathers who were the primary caregiver. The non-pregnant status of mothers/primary caregivers was verified through self-reporting. No significant difference was found between BMI of CSG

mothers/primary caregiver and non-CSG mothers/primary caregivers. The prevalence of overweight (26.5%) and obesity (37.2%) in mothers/primary caregiver in the total study population was high. The mean waist circumference (WC) of CSG mothers/primary caregivers was 90.0 cm (SD 16.8) versus 88.5 cm (SD 16.5) for non-CSG mother/primary caregivers (t-test: p = 0.021). These results indicated that the mean WC of women in both groups was above the cut-off point of 88 cm, which indicates a substantial increased risk for chronic diseases of lifestyle.[28]

In children the prevalence of underweight was 5.6%; while 20.7% were overweight. No significant difference was found in the prevalence of underweight, wasting and overweight in children receiving CSG or without CSG. The prevalence of 31.2% stunting found in this study was high according to the WHO classification for stunting.[18] There was a significant relationship between CSG recipients and those not receiving a CSG and stunting (34.9 vs. 22.7; X^2-test: p = 0.012), with a higher prevalence of stunting amongst CSG vs. non-CSG children, indicating poorer linear growth amongst the children of CSG recipients. The prevalence of stunting in the non-CSG children was medium high according to the WHO classification for stunting.[18] The mean MUAC of children of CSG recipients was 15.3 cm (SD 1.7) compared to 14.8 cm (SD 2.0) for children of non-CSG recipients, and an independent t-test (p = 0.026) showed this difference was significant, indicating the MUAC of children not receiving the CSG tended to be thinner than those receiving the CSG. However, the mean MUAC of both groups was above 13.5 cm, the cut-off point for well-nourished children. The MUAC of CSG children who were stunted (n=24) was 14.9 cm (SD: 1.8) vs. 15.5 cm (SD: 1.5) of non-stunted children (n=109), and this difference was significant (t-test: p = 0.0043) indicating that the MUAC of stunted CSG children tended to be smaller than CSG children who were not stunted. In non-CSG children there was no significant difference in the MUAC of those who were stunted (n=42) 14.8 cm (1.9) vs. not stunted (n=254) 14.9 cm (2.0); t-test; p = 0.78). The MUAC values of all children, regardless of whether they were CSG or non-CSG children, were above 12.5cm, the WHO cut-off point used as proxy for wasting. MUAC values below 13.5 cm, the cut-off point above which children are considered well nourished,[30] were found in 24 of the 133 stunted children (18%) and 42 non-stunted children (14%). There was no significant difference in the mean HAZ of those with a MUAC < 13.5 cm and MUAC≥ 13.5 cm. MUAC is both age and sex dependant and the mean values of both the CSG recipient and non-recipients fell within the range of median values in the WHO MUAC reference data, for age for boys and girls combined, namely from 14.3 to 16.5 cm, for ages 6 to 36 months.[18]

Table 4.3: Anthropometric status of Child Support Grant (CSG) and non-CSG mothers/primary care givers and their children

Mothers/primary caregivers	**All** (n = 446)	**CSG** (n = 308)	**Non-CSG** (n = 138)	**p-value**
BMI < 18. 5 kg/m2	3.8	3.3	5.1	
BMI 18.5– 25 kg/m2	32.5	33.4	30.4	X^2-test: P = 0.215
BMI 25–30 kg/m2	26.5	24.0	31.9	
BMI > 30 kg/m2	37.2	39.3	32.6	
Waist Circumference (cm)	89.5 (16.7)	90.0 (16.8)	88.5 (16.5)	t-test: p = 0.394
Children 0-36 months	(n=429)	(n=296)	(n=133)	
Underweight (WAZ ≤2)	5.6	6.0	4.6	t-test: p = 0.14
Wasted (WHZ ≤2)	0.7	0.7	0.86	t-test: p = 0.92
Stunted (HAZ ≤-2)	31.2	34.9	22.7	*X^2-test: P = 0.012
Overweight (BAZ ≥2)	20.7	18.5	25.8	t-test: p = 0.85
MUAC (cm)	15.2 (1.8)	15.3 (1.7)	14.8 (2.0)	*t-test: P = 0.021
MUAC of Stunted (HAZ ≤-2)	14.9 (1.8) t-test:	14.9 (1.8) t-test:	14.8 (1.9) t-test:	
MUAC of non-stunted (HAZ > – 2)	15.3 (1.8) p = 0.026	15.5 (1.5) p = 0.0043	14.9 (2.0) p = 0.78	

*: p - value < 0.05; CSG = Child Support Grant; MUAC= Mid-upper arm circumference; Values are expressed percentages or where indicated as mean (standard deviation)

4.6 Discussion

This study described the association between food security in households with and without the CSG in Avian Park and Zweletemba. The study found no significant difference in the prevalence of underweight, wasting and overweight in CSG children and non-CSG children, but the prevalence of stunting was significantly higher in CSG children. The high prevalence of stunting in children and overweight in adult women in the same communities has also been reported by SANHANES-1,[32] NFCS,[33] NFCS-FB-1,[34] Kimani-Murage et al,[35] Toriola[36] and Smuts et al.[37] in SA, but previous studies have not specifically focused on and distinguished between the levels of stunting in children in relation to whether they were CSG recipients or not.

Non-CSG households were more food secure than CSG households. The number of people in the household, number of people sharing a room, household income and HHAI differed significantly between CSG and non-CSG households, and the situation was always better in non-CSG households than in CSG households. The mean monthly income of CSG households was R 2 723 and the income per person was R544, based on the mean number of people per household. The CSG contributed 9.5% to the mean household income in CSG households. It is important to note it is not possible to report if

some of the children in the 31% non-CSG households were eligible to receive a CSG, as it was not an aim of the CNSP to assess whether all eligible children were receiving a CSG. A 2010 GHS report on the social profile of SA estimated that 36% of children in SA in the Western Cape lived in poor households with less than R570 month available per person in the household.[38] The Child Gauge 2010/2011[31] reported in 2008 around 82% of all children in SA, aged 0-13 years, were eligible for the CSG and almost 72 % of eligible children accessed the grant. The Child Gauge 2010/2011 reported child poverty is high in SA and 61% of children lived in households with a household income of below R522 per month.[31] It is possible to state that children in CSG households in this study lived in poverty, as the income per person in CSG households was less than R570, the Statistics South Africa 2010 cut-off point to describe child poverty.[38]

The level of food security in CSG households and non-CSG households was similar when comparing their Food Security Status. However, a difference in food security was showed with higher HFIAS scores in CSG households as well as the difference in the experience of CSG households and non-CSG households in the three Household Food Insecurity Access-related Domains. Households receiving a CSG experienced more anxiety and uncertainty about household food supply; insufficient food quality as well as insufficient food intake and its physical consequences. The dietary diversity[17] of more than half (56%) of all mothers/primary caregivers was a problem with a DDS ≤ 4, the cut-off level indicating dietary inadequacy.[25] Furthermore the mean DDS of 4.4, just above the cut-off level of 4, also showed there is a need for nutrition education to women in Avian Park and Zweletemba to improve the quality of their dietary intake, since 20% and 15 % of these women lived in households with a monthly income of respectively R3000 to R5000, and above R5000 per month. Generally a diet with a low dietary diversity includes more staple foods that are also more energy dense.[39] Considering that 37% of all mothers/primary caregivers were overweight and obese according to their BMI's and WC, with an increased risk for non-communicable diseases, there is a need for intervention focussing on improvement of their diets in terms of dietary diversity and energy content. Schönfeldt argued the cost of a daily balanced diet is not affordable for poor families living in SA and suggested the government should implement interventions to increase the intake of a variety of foods and lowering of food prices to eliminate the problem of people consuming enough calories to survive, but lack certain nutrients.[39]

The right to freedom from hunger and malnutrition is a fundamental human right that entails the enjoyment of adequate food.[40] The South African Bill of Rights[41] protects the rights of all people in South Africa and affirms the democratic values of human dignity, equality and freedom.[41] Article 27 in the South African Constitution grants refers to the right to food and social security for those who are deprived and mentions their right to

"sufficient food and water; and social security, if they are unable to support themselves and their dependants, appropriate social assistance."[41] The economy in SA has showed positive growth in recent years,[42] but unemployment has persisted to be a problem[43] and therefore many households lack the income they require to access food. Household food security is dependent upon physical or economic access to sufficient, safe and nutritious food from household income or own production. Economists have often assessed the impact of the CSG on the economy in SA and agree that the social assistance system in SA is well-developed, that social grants are well targeted and have a significant mitigating impact on to reduce poverty.[9,10,44-50]

SANHANES-1 reported that 57.9% of households in the Western Cape were food secure. This study in Avian Park and Zweletemba found 63% of households were food secure, with a higher prevalence of household food security (70.5%) in non-CSG households. According to the General Household Survey 2010 the main sources of household income in SA are salaries earned from employment, grants, income from own business, remittances and pensions.[52] The prevalence of unemployment in all households was 60% in this study with no difference in the prevalence of unemployment between households receiving or not receiving a CSG grant, yet there was a significant difference in household income of households with and without a CSG. The socio-economic situation in households differed significantly regarding household income, number of people in household, number of people sharing a room and number of grants received in the household. Furthermore the household income was less in CSG households but the number of people in the household and number of people sharing a room was more. This situation of where households who received grants had more members than those without has also been reported by Statistics South Africa and economists assessing the CSG and social security in SA.[44–47,53] A comment by Van der Berg[47] that social grants have reduced inequality and decreased the prevalence, depth and severity of poverty in households has merit.

A May 2012 impact assessment of the CSG report showed that if a child had received the CSG within the first two years of life there was an increased chance that the child was regularly taken to a primary health care clinic for growth monitoring and the study also found higher HAZ scores in children whose mothers had more than eight grades of schooling. This finding provided evidence of the CSG's role as an investment in human growth and development.[5] A 2008 review of the CSG in SA acknowledged the important role of the CSG in enabling caregivers to access food of sufficient nutritional quality and variety to meet the child's needs and strongly suggests that early and regular access to the CSG is required to have an effective and sustained impact on children's nutritional status.[54] It was not possible to directly compare the finding of the CNSP[12] project with the

abovementioned two reports regarding child growth and the CSG, but the higher prevalence of stunting amongst those who received a CSG in this study did not reflect optimal child growth in the first two year of life in terms of H/A growth. Grantham-McGregor et al. stated that both the prevalence of early childhood stunting and the number of people living in absolute poverty are indicators of poor development.[55] Victora et al.[56] reported there is evidence of an association between stunting during infancy and risk for obesity and non-communicable diseases of lifestyle in adulthood. Bhutta et al.[4] stated it would be impossible for countries to break the vicious cycle of poverty or maintain economic developments, if their population is unable to achieve nutrition security. Bhutta el al. projected undernutrition reduces a nation's economic development by at least 8% through direct productivity losses, losses due to poorer cognition and through reduced schooling.[4]

A 2011 economic analysis of the impact of CSG in SA found some of the money allocated to households by the CSG appears to be spent on improving the well-being of children and so the CSG had a positive impact on the health, nutrition and education of children receiving the CSG.[10] The high levels of stunting in children, 0-36 months old, in this 2011 study, and higher levels of stunting amongst CSG grant recipients suggested that household income, augmented by the CSG, was not the only factor that influenced nutrition security. The CSG is a nutrition-sensitive programme and it is not sufficient on its own to address the problem of stunting. The Lancet series of 2008 and 2013 provide valuable information about both evidence-based nutrition-specific interventions strategies across the life-cycle.[4,7,14,15,56] Victora[56] reported there is evidence that prevention of maternal and child undernutrition is a long-term investment that will benefit the present generation and their children. Furthermore there is evidence that rapid weight or length gain in the first 2 years of life increases the risk of chronic disease, even in children with poor foetal growth.[56] Nutrition during pregnancy affects foetal growth, and optimal nutrition for women at the time of conception and throughout pregnancy is vital.[56] When the infant is born the promotion of optimal nutrition including needs to focus on exclusive breastfeeding for the first 6 months of life and optimal complementary feeding practices when the child is six months old.[4,14,15] Goosen assessed the factors that influenced feeding practices of primary caregivers of infants under 6 months old in Avian Park and Zweletemba, and found that only 6% of mothers breastfed their infants exclusively, 36% breastfed predominantly whilst 27% breastfed partially, since water, formula milk and/or food were introduced at an early age. Goosen reported that mothers had knowledge of the health and economic benefits of breastfeeding and initiated breastfeeding but the lack of community-based postnatal support and a number of barriers existed., These barriers included that mothers believed their milk was not enough to satisfy their infants need and

that infants needed to water and non-prescription medicines. The main source of knowledge regarding infant feeding were health care workers and maternal grandmothers.[57] Information regarding exclusive breastfeeding is one of the aspects that health care workers should offer to pregnant women and considering the findings of this study there is a need to develop comprehensive community-based intervention programme in Avian Park and Zweletemba that focuses on the first thousand days from conception to a child's second birthday.[14,15]

Most of the research regarding the impact of the CSG was done by economists and did not include an assessment of the food security in households receiving a CSG. The analysis of food security included in this study showed more food insecurity in CSG households than in non-CSG households. The role of the CSG in poverty alleviation has been confirmed,[43-49] but the linkage of CSG recipients to other poverty alleviation programmes and developmental initiatives have not been established[54] and is essential for additional improvement of the food security situation in CSG households.

4.7 Strengths and limitations

The strength of this study was that a wide-ranging selection of factors that give an extensive understanding of conditions that influence household food security and child nutritional status were included. The use of socio-economic variables that were constructed to calculate a HHAI to verify the household economic status strengthened this study since it was not always possible to know how reliable household income data was. Not many studies in SA and in the Western Cape have specifically assessed the relationship between nutrition security and the CSG, therefore this study added to the knowledge base understanding of the role of the CSG in poor households. A limitation of this study was that aspects specifically necessary to assess whether all eligible children were receiving a CSG, were not included in this study, and that information would have added to the significance of the data collected. The CNSP questionnaires were extensive and the findings of this study should be further explored by assessing the data collected during the qualitative data collection phase of the project. There was a possibility of recall bias on the side of participants, and this was perhaps specifically true and relevant in terms of sensitive issues, i.e. household income. The fieldworkers were trained to conduct the data collection interview in an objective manner, but it was possible that interviewer bias could have occurred.

4.8 Conclusion and recommendations

The primary objective of the CSG is to enable caregivers of young children living in extreme poverty to access financial assistance in the form of a cash transfer to

supplement, rather than replace, household income and consequently to protect children from the impact of poverty and address inequality.[47] The CSG fits the definition of a nutrition sensitive programme.[7] This study found an association between food security and the CSG. CSG households were more food insecure and therefore it is necessary to assist the communities of Avian Park and Zweletemba to develop a community-based programme that will support all households to enhance child nutrition and development by empowering young people and mothers in poor households with more knowledge of child care and nutrition. Optimal growth and health requires sufficient nutritious food and good health and daily care of children.[58] This intervention programme should include be a strong drive to specifically involve the vulnerable CSG households. The recent review by Black[15] validated the evidence that infants who growth faltered in their early life, and then gained weight rapidly later in childhood, could have a risk of adult obesity and non-communicable diseases. The SA government's National Development Plan.[11] proposed the introduction of a nutrition programme for pregnant women and young children. This study in Avian Park and Zweletemba indicated the need for the proposed programme, and showed the need for this programme to be comprehensive and include a nutrition support, promotion and education programme for pregnant women and young children, incorporating best practices and the first 1000 days. Furthermore the findings of this study suggested that access to the CSG should be linked to the proposed programme.

The high levels of stunting in children and obesity in women in poor households and socio-economic circumstances in this study, also indicated how important it is for the South African government to strengthen the relevant actions included in the Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa, 2012-2016,[59] which promote maternal, infant and young child nutrition. The suggestions in the WHO Population-based approaches to childhood obesity prevention[60] should be considered in the planning of community-based intervention programmes. Health and nutrition promotion to equip the households in Avian Park and Zweletemba to improve their individual food intake and follow a healthier diet and lifestyle should be implemented for different target groups for example in schools and for unemployed. The promotion of the SA Food-based Dietary Guidelines[61] is not necessarily the most suitable intervention, since Schönfeldt argued that food-based dietary guidelines have little relevance in circumstances where financial means limit food choice.[62] The CNSP team should establish pilot intervention projects in Avian Park and Zweletemba to develop effective community-based programmes that embrace the 1000 days movement.

4.9 References

1. United Nations Development Programme- Millennium Development Goals [Online] http://www.undp.org/content/undp/en/home/mdgoverview.html [2013,10 September]
2. Declaration of the World Summit on Food Security. Rome, 16-18 November 2009 [Online] http://www.fao.org/fileadmin/templates/wsfs/Summit/Docs/Final_Declaration/WSFS09_Declaration.pdf [2013, 11 September]
3. Republic of South Africa. Millennium Development Goals: Country Report. (2010) [Online] http://www.statssa.gov.za/news_archive/Docs/MDGR_2010.pdf [2013, 26 October]
4. Bhutta ZA, Das JK, Rizvi A, et al. Evidence-based interventions for improvement of maternal and child nutrition: what can be done and at what cost? Lancet June 6, 2013. [Online] doi:10.1016/S0140-6736(08)61345-8 [2013, 24 June]
5. DSD, SASSA and UNICEF. (2012) The South African Child Support Grant Impact Assessment: Evidence from a survey of children, adolescents and their households. Pretoria: UNICEF South Africa. [Online] http://www.dsd.gov.za/index2.php?option=com_docman&task=doc_view&gid=286&Itemid=39 [2011, 28 October]
6. You and your grants 2013/14. [0nline] http://www.sassa.gov.za/Portals/1/Documents/05283ff8-ef75-4869-94b6-c026334269ef.pdf [2013, 23 September]
7. Ruel MT, Alderman H, and the Maternal and Child Nutrition Study Group. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress in improving maternal and child nutrition? Lancet: June 6, 2013 [Online] http://dx.doi.org/10.1016/S0140-6736(13)60843-0 [2013, 17 September]
8. Improving child nutrition: The achievable imperative for global progress. UNICEF. (April 2013) [Online] http://www.unicef.org/publications/index_68661.html [2013, 27 September]
9. Agüero JM, Carter MR, Woolard I. The impact of unconditional cash transfers on nutrition: The South African Child Support Grant. International Poverty Centre. Working paper, no. 39, September 2007. [Online] Available: http://www.saldru.uct.ac.za/home/index.php?/component/option,com_docman/Itemid,32/gid,236/task,doc_download/ [2012, 28 October]
10. Coetzee M. Finding the Benefits: Estimating the Impact of the South African Child Support Grant. Stellenbosch Economic Working Papers: 16/11 Department of Economics and the Bureau for Economic Research at the University of Stellenbosch

[Online] Available: www.ekon.sun.ac.za/wpapers/2011/wp162011/wp-16-2011.pdf [2011, 28 October]

11. National Development Plan 2030. Our Future-make it work. [Online] http://www.npconline.co.za/MediaLib/Downloads/Downloads/Executive%20Summary-NDP%202030%20-%20Our%20future%20-%20make%20it%20work.pdf [2013, 26 October]
12. McLachlan MH and co-workers. Division of Human Nutrition, Stellenbosch University, September 2010. Stellenbosch University Food Security Initiative. A Community Nutrition Security Research Project in the Breede Valley, Western Cape Province, South Africa – baseline study. Final research protocol, 10 February 2011. Approved by the Human Research Committee of the Faculty of Health Sciences, Stellenbosch University Ethics Committee (N10/11/368)
13. Koornhof HE, McLachlan MH, Faber M. (2013) Household food and nutrition security in Avian Park and Zweletemba. (completed to be submitted for publication)
14. Black RE, Allen LH, Bhutta ZA, et al. Maternal and child undernutrition: global and regional exposures and health consequences. Lancet 2008; 371: 243–60. [Online] Available: http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616900 [2013, 22 May]
15. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet: June 6, 2013 [Online] http://dx.doi.org/10.1016/S0140-6736(13)60996-4 [2013, 17 September]
16. Coates J, Swindale A, BilinskyP. Household Food Insecurity Access Scale (HFIAS) for Measurement of Household Food Access: Indicator Guide (v. 3). Washington, D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development, August 2007. [Online] Available: http://www.fao.org/fileadmin/user_upload/eufao-fsi4dm/doc-training/hfias.pdf [2013, 23 September]
17. Swindale A, Bilinsky P. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide (v.2). Washington, D.C.: FHI 360/FANTA. http://www.fantaproject.org/sites/default/files/resources/HDDS_v2_Sep06_0.pdf [2013, 23 September]
18. Physical status: the use and interpretation of anthropometry. (1995) Report of a WHO Expert Committee. Technical Report Series No. 854. Available [Online] http://www.who.int/childgrowth/publications/physical_status/en/index.html [2013, 30 August]

19. Cogill B. (2003) Anthropometric Indicators Measurement Guide. Washington, D.C.: Food and Nutrition Technical Assistance Project, Academy for Educational Development. [Online] http://www.fantaproject.org/publications/anthropom.shtml [2013, 1 September]
20. WHO Anthro for personal computers, version 3.2.2, 2011: Software for assessing growth and development of the world's children. Geneva: WHO, 2010. [Online] http://www.who.int/childgrowth/software/en/ [2013, 5 June]
21. Hatloy A, Torheim LE, Oshuag A. Food variety- a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. European Journal of Clinical Nutrition 1998; 52: 891- 8.
22. Faber M, Schwabe C, Drimie S. Dietary diversity in relation to other household security indicators. International Journal of Food Safety, Nutrition and Public Health 2009; 2(1): 137-177. [Online] http://www.hsrc.ac.za/Research_Publication-20348.phtml [2012, 1 October]
23. Labadarios D, Mchiza ZJ, Steyn NP, et al. Food security in South Africa: a review of national surveys. Bulletin of the World Health Organanization 2011;89: 891-899.[Online] doi: 10.2471/BLT.11.089243 [2013, 23 September]
24. Oldewage-Theron W & Kruger R. Dietary diversity and adequacy of women caregivers in a peri-urban informal settlement in South Africa. Nutrition 2011; 27:420-427.
25. Steyn NP, Nel JH, Nantel G, Kennedy G, Labadarios D. Food variety and dietary diversity scores in children: are they good indicators of dietary adequacy? Public Health Nutrition 2006;9(5):644–650 [online] http://www.ncbi.nlm.nih.gov/pubmed/16923296 [2013, 3 October]
26. Filmer D & Pritchett L. 1998. Estimating wealth effects without expenditure data- or tears: an application to educational enrollments in states in India. Policy research working paper 1994. [Online] http://www-wds.worldbank.org/external/default/WDSContentServer/IW3P/IB/1998/11/17/000178830_98111703524522/Rendered/PDF/multi_page.pdf [2013, 5 June]
27. Obesity: preventing and managing the global epidemic: report of a WHO consultation. Technical Report Series No. 894. 1999. [Online] http://whqlibdoc.who.int/trs/WHO_TRS_894.pdf [2013, 6 September]
28. Waist circumference and waist–hip ratio: report of a WHO expert consultation, Geneva, 8–11 December 2008. [Online] http://www.who.int/nutrition/publications/obesity/WHO_report_waistcircumference_and_waisthip_ratio/en/index.html [2013, 2 October]

29. Onis M (ed), et al. (2006) WHO child growth standards : length/height-for-age, weight-for-age, weight-for-length, weight-for-height and body mass index-for-age : methods and development [Online] http://www.who.int/childgrowth/standards/Technical_report.pdf [2013, 6 September]
30. United Nation System. Standing Committee on Nutrition: Task Force on Assessment, Monitoring, and Evaluation. Fact sheets on Food and Nutrition Security Indicators/Measures: Mid-Upper Arm Circumference (MUAC) [Online] http://www.unscn.org/files/Task_Forces/Assessment_Monitoring_and_Evaluation/MUAC.pdf [2013, 4 November]
31. Jamieson L, Bray R, Viviers A, et al. (eds) (2011) South African Child Gauge 2010/2011.
Cape Town: Children's Institute, University of Cape Town (2011) South African Child Gauge 2009/2010 Cape Town: Children's Institute, University of Cape Town Children's Institute, University of Cape Town [Online] http://opencontent.uct.ac.za/Health-Sciences/South-African-Child-Gauge-20102011 [2013, 4 November]
32. Shisana O, Labadarios D, Rehle T, Simbayi L, Zuma K, Dhansay A, et al & SANHANES-1 Team (2013). South African National Health and Nutrition Examination Survey (SANHANES-1). Cape Town: HSRC Press. [Online] http://www.hsrc.ac.za/en/media-briefs/population-health/results-sanhanes1 [2013, 1 September]
33. Labadarios D (editor), Steyn NP, Maunder E, et al. The National Food Consumption Survey (NFCS): children aged 1–9 years, South Africa, 1999. Pretoria: Department of Health; 2000. [0nline] DOI: 10.1079/PHN2005816 [2013, 6 September]
34. Kruger HS, Steyn NP, Swart EC, et al. Overweight among children decreased, but obesity prevalence remained high among women in South Africa, 1999-2005. Public Health Nutrition 2012;15(4):594-599 [Online] http://www.ncbi.nlm.nih.gov/pubmed/22005093 [2013, 6 September]
35. Kimani-Murage EW, Kahn K, Pettifor JM, et al. (2010) The prevalence of stunting, overweight and obesity, and metabolic disease risk in rural South African children. BMC Public Health 2010;10:158 [Online] http://www.biomedcentral.com/content/pdf/1471-2458-10-158.pdf [2013, 29 August]
36. Toriola AL, Moselakgomo V, Shaw B, et al. Overweight, obesity and underweight in rural black South African children. South African Journal of Clinical Nutrition 2012;25(2):57-61 [Online] http://www.sajcn.co.za/index.php/SAJCN/article/view/557/864 [2013, 4 November]

37. Smuts CM, Faber M, Schoeman SE, et al. Socio-demographic factors and anthropometric status of 0-71-month-old children and their caregivers in rural districts of the Eastern Cape and KwaZulu-Natal provinces of South Africa. South African Journal of Clinical Nutrition 2008;21(3):117-125 [Online] http://www.sajcn.com/index.php/SAJCN/article/view/200 [2013, 6 September]
38. Social profile of South Africa, 2002–2010. Statistics South Africa. (2011) [Online] https://www.statssa.gov.za/Publications/Report-03-19-00/Report-03-19-002002.pdf [2013, 10 November]
39. Schönfeldt HC, Gibson N, Vermeulen H. The possible impact of inflation on nutritionally vulnerable households in a developing country using South Africa as a case study. Nutrition Bulletin 2010:35; 253-266
40. General Comment 12. Committee on Economic, Social and Cultural Rights, 20th session, Geneva, E/C.12/1999/5, 12 May 1999, Agenda item 7 [Online] http://daccess-dds-ny.un.org/doc/UNDOC/GEN/G99/420/12/PDF/G9942012.pdf?OpenElement [2013, 23 September]
41. Constitution of the Republic of South Africa. Act no. 108 of 1996. [Online] http://www.info.gov.za/documents/constitution/1996/a108-96.pdf [2013, 23 September]
42. South Africa: Economy overview. SouthAfrica.info 28 February 2013. [Online] wihttp://www.southafrica.info/business/economy/econoverview.htm#.Unp8dHCnqwU [2013, 5 November]
43. SA's unemployment rates rise to near-record levels. Daily Maverick. 2 August 2013 [Online] http://www.dailymaverick.co.za/article/2013-08-02-sas-unemployment-rates-rise-to-near-record-levels/#.Unp5fHCnqwU [2013, 5 November]
44. Van der Berg, Siebrits K, Lekezwa B. Efficiency and equity effects of social grants in South Africa. Stellenbosch Economic Working Papers: 15/10. Department of Economics and the Bureau for Economic Research at the University of Stellenbosch [Online] http://www.ekon.sun.ac.za/wpapers/2010/wp152010 [2013, 5 November]
45. Pauw K, Mncube L The impact of growth and redistribution on poverty and inequality in South Africa. International Poverty Centre. Country study number 7, June 2007 [Online] http://www.ipc-undp.org/pub/IPCCountryStudy7.pdf [2013, 17 September]
46. Chitiga M, Decaluwe B, Mabugu R, et al. The impact of the international economic crisis on child poverty in South Africa. University of Pretoria, Department of Economics, Working paper series, no. 2010-15. [Online] http://web.up.ac.za/sitefiles/file/40/677/WP_2010_15.pdf [2013, 17 September]

47. Van der Berg S. Declining poverty in South Africa- The role of social grants. First annual conference on the Economics of Social Protection, Pilanesberg, 14 June 2007 [Online] http://web.up.ac.za/UserFiles/Keynote%20S%20van%20der%20Berg%20paper.pdf [2011, 28 October]
48. Armstrong P, Burger C. Poverty, Inequality and the Role of Social Grants: An Analysis using Decomposition Techniques. Working paper (15/09) of the Department of Economics and the Bureau for Economic Research at the University of Stellenbosch [Online] www.ekon.sun.ac.za/wpapers/2009/wp152009/wp-15-2009.pdf [2013, 19 October]
49. Leibbrandt M, Bhorat H, Woolard I. Contemporary household inequality in South Africa. Development Policy Research Unit. Working Paper 99/25 [Online] http://dspace.cigilibrary.org/jspui/handle/123456789/7530 [2013, 5 November]
50. Armstrong P, Lekezwa B, Siebrits K. Poverty in South Africa: A profile based on recent household surveys. Stellenbosch Economic Working Papers: 04/08 [Online] http://www.ekon.sun.ac.za/wpapers/2008/wp042008/wp-04-2008.pdf [2013, 19 October]
51. Du Toit DC. (2011) Food Security. Directorate Economic Services, Department of Agriculture, forestry and fisheries. [Online] http://www.nda.agric.za/docs/GenReports/FoodSecurity.pdf [2013, 18 November]
52. General Household Survey 2010. (July 2010) [Online] http://www.statssa.gov.za/publications/P0318/P0318June2010.pdf [2012, 20 October]
53. Statistical release - P0318.1 General Household Survey Series, Volume I. Social Grants: In-depth analysis of the General Household Survey data 2003–2007 [Online] https://www.statssa.gov.za/publications/P03181/P031812007.pdf [2013, 23 September]
54. Review of the Child Support Grant: Uses, Implementation and Obstacles. United Nations Children's Fund, June 2008. www.case.org.za [Online] http://www.case.org.za/images/docs/child_support_grant08.pdf [2013, 24 September]
55. Grantham-McGregor S, Cheung YB, Cueto S, Glewwe P, Richter l, Strupp B. Developmental potential in the first 5 years for children in developing countries. Lancet 2007;369: 60-70. [Online] Available: http://www.thelancet.com/journals/lancet/article/PIIS0140-6736(07)60032-4/abstract [2013, 27 September]
56. Victora CG, Adair L, Fall C, Hallal P C, Martorell R, Richter L, Sachdev H S. Maternal and child undernutrition: consequences for adult health and human capital. Lancet 2008;371: 340–357 [Online] Available:

http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616924 [2013, 3 October]

57. Goosen C. (2013) Factors influencing feeding practices of primary caregivers of infants (o – 5.9 months old) in Avian Park and Zwelethemba, Western Cape, South Africa. Thesis (M Nutr.) Stellenbosch University. [Online] http://scholar.sun.ac.za/handle/10019.1/80071 [2013, 11 November]
58. UNICEF. (1990) Strategy for Improved Nutrition of Children and Women in Developing Countries. New York: UNICEF [Online] http://www.ceecis.org/iodine/01_global/01_pl/01_01_other_1992_unicef.pdf [2013, 3 November]
59. Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa. 2012–2016 [Online] http://www.doh.gov.za/docs/stratdocs/2012/MNCWHstratplan.pdf [2013, 19 October]
60. Population-based approaches to childhood obesity prevention. World Health Organisation. 2012 [Online] http://www.who.int/dietphysicalactivity/childhood/approaches/en/ [2013, 3 October]
61. South African Food-Based Dietary Guidelines. South African Journal of Clinical Nutrition 2001;14(3):Supplement,Sl-S80 [Online]http://www.sahealthinfo.org/nutrition/safoodbased.htm [2013, 1 September]
62. Schönfeldt HC, Hall N, Bester M. Relevance of food-based dietary guidelines to food and nutrition security: A South African perspective. Nutrition Bulletin 2013; 38: 226-235 [Online] http://onlinelibrary.wiley.com.ez.sun.ac.za/doi/10.1111/nbu.12027/pdf [2013, 16 November]

CHAPTER 5 GENERAL SUMMARY AND CONCLUSIONS

5.1 Summary of main findings

This study aimed to describe the household food security (HFS) in the communities of Avian Park and Zweletemba and to assess whether there was a difference in HFS in the formal and informal settings in these communities as well as if there was an association between household income, HFS, poverty experience, anthropometric status of mothers/primary caregivers and their children, 0-36 months. Furthermore the study compared households receiving the child support grant (CSG) with households not receiving the CSG in terms of the anthropometric status of the mothers/ primary caregivers, their age, educational level, the anthropometric status of their children, the household income and number of people in the household.

A secondary analysis was performed of selected of data obtained during the 2011 baseline study of Community-based Nutrition Security Project (CNSP)[1] in Avian Park and Zweletemba settlements in the Breede Valley local municipality of the Western Cape Province, South Africa. The two settlements Avian Park and Zweletemba are situated on different sides of Worcester, but both are described as low-socio-economic areas.[2] Data was analysed to assess the food and nutrition situation of children under three years old and their mothers/ primary caregivers in relation to two factors, i.e. type of housing and the CSG. The analysis for type of housing distinguished between Households living in formal (brick houses, town houses, flats) and those living in informal (squatter shacks, huts) houses, referred to as formal and informal households. The analysis regarding the CSG compared households with mothers/ primary caregivers receiving at least one CSG with those who did not receive a CSG.

The main findings of the study described the situation in Avian Park and Zweletemba in relation to type of housing showed household income was higher in formal households. Household income was also higher in non- CSG than in CSG households. The average household size, in terms of number of people living in the household, was higher in formal households than in informal households, thus there were more people living together in formal households and the higher household income was shared amongst more people. Household asset index (HHIA) a proxy for long-run household wealth and suitable control for household economic status confirmed the healthier socio-economic situation in formal households. There was no meaningful difference in the demographic characteristics of CSG recipients and non-recipients of a CSG in terms of mean age, marital status; employment status, level of education obtained, number of grants received or type of dwelling in which they lived. The mean monthly income of all CSG

households was however higher than in non-CSG households. The household size in terms of number of people in the household and number of people sharing a room was more in CSG households than in non-CSG households.

Sixty three percent of all HHs in Avian Park and Zweletemba were food secure and food insecurity was higher amongst informal households and households receiving a CSG. Diet diversity, an indicator of the adequacy of dietary intake, was better in formal than in informal households, as well as in non-CSG compared to CSG households. The dietary diversity score of 56% of mothers/ primary caregivers was below 4, indicating inadequate diet quality. A high prevalence of stunting and overweight was found in the children and the prevalence of stunting was higher in households receiving a CSG. There were high prevalences of overweight and obesity amongst the mothers/ primary caregivers and the waist circumference of the mothers/ primary caregivers was above the cut-off point of 88 cm, which indicates a substantial increased risk for chronic diseases of lifestyle.

5.2 General conclusion

The research described in this thesis suggested various reasons for the high levels of stunting in children and overweight and obesity in women in these communities. Poor socio-economic status lied behind all of these factors. This study looked at the role of two important socio-economic factors, namely type of housing and social security. Children living in informal housing households had a worse socio-economic situation showed by their higher food insecurity status and lower HHAI. Likewise more children living in households, where low income qualified mothers/ primary caregivers to receive a CSG, were exposed to food insecurity in the household. To address the problem of stunting in children as well as overweight and obesity in children and mothers/ primary caregivers, poverty alleviation together with education regarding an adequate diet should be essential strategies. Intervention focussing on the first thousand days of life, as described in the Lancet Series on Maternal and Infant Undernutrition, is necessary and should be made a priority. Nutrition security is dependent upon availability of money/ household income as well as health care, general care practices and nutritional knowledge of mothers/ primary caregivers. All of these factors require attention in the development of intervention to address the problems in Avian Park and Zweletemba. In the short term the cost of a diverse diet is a challenge for poor people, therefore the planning of community-based intervention programmes in Avian Park and Zweletemba to equip the residents in these communities to improve their dietary intake and nutrition security needs urgent attention.

5.3 Recommendations

The outcomes of this study sanction the recommendations of previous studies in SA, that there is an urgent need to include strategies that improve dietary diversity in nutrition intervention programmes. The CNSP team and the local authority's community development department, relevant role players i.e. existing organisations and institutions in the community i.e. schools, health service providers and churches and community leaders community leaders and other representatives should work closely together to develop programmes that include interventions that will assist in improving the household food security and infant feeding practices in Avian Park and Zweletemba. Responsible role-players should build on interventions that have been proven to work (e.g. individual and groups counselling)[3] and invest in testing behaviour change communication programmes and approaches and other intervention strategies in an organised way. Additionally, roleplayers should involve the different identfied vulnerable groups, i.e poor, unemployed women in the process of planning an intervention programme to empower the community to improve their dietary intake and nutrition security. These interventions should aim to reduce childhood stunting and maternal overweight as both as are risk factors non-communicable diseases in adulthood.

Schools are an a ideal setting for health and nutrition promotion since schools are where children spend a lot of time learning, working and playing. The CNSP team should engage with the governing bodies at schools and teachers to establish partnerships and collaboration and create an awareness of, and establish activities mentioned in the WHO documents: Global Strategy on Diet, Physical Activity and Health[4] and Population-based approaches to childhood obesity prevention.[5]

The possibility of promoting the establishment of household vegetable gardens[6] needs to be investigated, since it could assist with increasing dietary diversity and serve as a tool for nutrition education. During the data collection period quite a few vegetable gardens were noticed. Fruit and vegetable gardens programmes should include nutrition promotion and education and focus on improvement of people's knowledge and skills regarding the importance of increasing their dietary diversity to achieve nutrition security and enhance their well-being.[6] The high levels of stunting in children and obesity in women in poor households and socio-economic circumstances found in this study, also showed a need for the South African government to market and strengthen the relevant actions included in the Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa, 2012-2016,[7] which promote maternal, infant and young child nutrition. The CNSP team should assist

government by doing this in the Breede Valley where Avian Park and Zweletemba is situated.

The presence of under-nutrition in children, combined with overweight in women need to be taken into consideration in the planning of intervention to improve the household food security situation in Avian Park and Zweletemba. In order to improve household food security and the nutrition security of each member in the households it is essential that nutrition promotion and education should focus on improving knowledge and skills.[6] The SA Food-based Dietary Guidelines[8] were introduced in 2001, but it has not been assessed to what extent these guidelines have been embraced by all South Africans in their diets. The establishment and promotion of community based as well as household fruit and vegetable gardens are short-term interventions that need to be considered in Avian Park and Zweletemba, especially in light of the fact that there are many families with incomes below R1 000 per month and who are probably unemployed. There is also a need for intervention programmes that include behaviour change that supports a healthy lifestyle; including regular activity and a healthy diet. The promotion of the SA Food-based Dietary Guidelines[8] is not necessarily the most suitable intervention, since Schönfeldt has questioned the relevance of food-based dietary guidelines in circumstances where financial means limit food choice.[9]

The development of a marketing strategy to motivate and encourage the community to use the current health-facility based intervention programmes to prevent stunting in children younger than 2 years old is one of the primary interventions that should be implemented. These programmes include the Mother Baby Friendly Initiative, Integrated Management of Childhood Illnesses and the Nutrition Therapeutic Programme[7,10] to ensure the optimal implementation of the new Road to Health booklet[10] and the promotion of infant and young child growth.

The main objective of the CSG is to enable caregivers of young children living in extreme poverty to access financial assistance in the form of a cash transfer to supplement, rather than replace, their household income and consequently to protect children from the impact of poverty and address inequality.[11] The CSG fits the definition of a nutrition sensitive programme.[12] The association between food security and the CSG found in this study is of concern as the prevalence of stunting was higher amongst children in CSG households and they were more food insecure. There is an urgent need to assist the communities of Avian Park and Zweletemba to develop a community-based programme that will support all households to enhance child nutrition and development by empowering young people and mothers in poor households with more knowledge of child care and nutrition. This intervention programme should include be a

strong drive to specifically involve the vulnerable CSG households. The recent review by Black[13] validated the evidence that infants who growth faltered in their early life, and then gained weight rapidly later in childhood, could have a risk of adult obesity and non-communicable diseases. The SA government's National Development Plan.[14] proposed the introduction of a nutrition programme for pregnant women and young children. This study in Avian Park and Zweletemba indicated the need for the proposed programme, and showed the need for this programme to be comprehensive and include a nutrition support, promotion and education programme for pregnant women and young children, incorporating best practices and the first 1000 days. Furthermore the findings of this study suggested that access to the CSG should be linked to the proposed programme.

The CNSP team should urgently establish pilot intervention projects in Avian Park and Zweletemba to develop effective community-based programmes that embrace the 1000 days movement.

5.4 Future research

The findings of this study prompt a number of additional questions. There is for instance a need to explore the reasons why poor dietary diversity exists in these communities to support the development of appropriate interventions to address the identified problems. Future studies that could provide insight and a better understanding of the problems found are:

1. One of the findings of the study was that there was no association between dietary diversity and the body mass index of mothers/ primary caregivers. Further analysis of CNSP data to assess whether is difference in the dietary diversity of women with a normal body weight and overweight and obese women in Avian Park and Zweletemba.
2. The dietary intake of the mothers during pregnancy and should also be investigated in this community to assist in the development of appropriate intervention strategies to promote optimal nutrition during pregnancy.
3. An investigation into the determinants of diet diversity in Avian Park and Zweletemba.
4. An investigation into the knowledge, attitudes, beliefs and practices of health care workers, primary and secondary school learners in Avian Park and Zweletemba regarding a healthy diet.

5.5 References

1. McLachlan MH and co-workers. A Community Nutrition Security Research Project in the Breede Valley, Western Cape Province, South Africa –

baseline study. Final research protocol 10 February 2011. Approved by the Human Research Committee of the Faculty of Health Sciences, Stellenbosch University Ethics Committee (N10/11/368).

2. Breede valley Municipality. Integrated development plan 2007 - 2011. 2007: 1-248
3. Bhutta ZA, Ahmed T, Black RE, Cousens S, Dewey K, Giugliani E, et al. Maternal and child undernutrition: What works? Interventions for maternal and child undernutrition and survival. Lancet 2008; 371:417-440 [Online] http://www.sciencedirect.com.ez.sun.ac.za/science/article/pii/S0140673607616936 [2013, 13 September]
4. World Health Organisation Global Strategy on Diet, Physical Activity and Health.(2004) [Online] http://www.who.int/dietphysicalactivity/strategy/eb11344/strategy_english_web.pdf [2013, 2 November]
5. Population-based approaches to childhood obesity prevention. (2012) [Online] http://apps.who.int/iris/bitstream/10665/80149/1/9789241504782_eng.pdf [2013, 2 November]
6. Food and Agriculture Organization. Agriculture, food and nutrition for Africa - A resource book for teachers of agriculture. Rome, FAO, 1997. [Online] http://www.fao.org/docrep/w0078e/w0078e00.HTM [2013, 16 November]
7. Strategic Plan for Maternal, Newborn, Child and Women's Health (MNCWH) and Nutrition in South Africa. 2012 – 2016 [Online]
8. South African Food-Based Dietary Guidelines. South African Journal of Clinical Nutrition 2001;14(3):S1-S80 [Online]
9. Schönfeldt HC, Hall N, Bester M. Relevance of food-based dietary guidelines to food and nutrition security: A South African perspective. Nutrition Bulletin 2013; 38: 226-235 [Online] http://onlinelibrary.wiley.com.ez.sun.ac.za/doi/10.1111/nbu.12027/pdf [2013, 16 November]
10. Department of Health. 2012. Roadmap for Nutrition in South Africa for 2012-2016. Final Draft. Pretoria, South Africa. http://www.doh.gov.za/docs/stratdocs/2012/MNCWHstratplan.pdf [2013, 19 October]
11. Van der Berg S. Declining poverty in South Africa- The role of social grants. First annual conference on the Economics of Social Protection, Pilanesberg, 14 June 2007 [Online] http://web.up.ac.za/UserFiles/Keynote%20S%20van%20der%20Berg%20paper.pdf [2011, 28 October]
12. Ruel MT, Alderman H, and the Maternal and Child Nutrition Study Group. Nutrition-sensitive interventions and programmes: how can they help to accelerate progress

in improving maternal and child nutrition? Lancet: June 6, 2013 [Online] http://dx.doi.org/10.1016/S0140-6736(13)60843-0 [2013, 17 September]

13. Black RE, Victora CG, Walker SP, et al. Maternal and child undernutrition and overweight in low-income and middle-income countries. Lancet: June 6, 2013 [Online] http://dx.doi.org/10.1016/S0140-6736(13)60996-4 [2013, 17 September]
14. National Development Plan 2030. Our Future-make it work. [Online] http://www.npconline.co.za/MediaLib/Downloads/Downloads/Executive%20Summary-NDP%202030%20-%20Our%20future%20-%20make%20it%20work.pdf [2013, 26 October]

ADDENDUM A: Socio-demographic questionnaire

1. Who is head of the household **My Child's**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other
2. How would you describe yourself in terms of population group ***(Population group as perceived by the woman herself)***	African	Colored	Indian	White	Other (Specify)							
3. What is your first language?	Afrikaans	English	Xhosa	Zulu	Other							
4. What is your marital status?	Unmarried	Married	Divorced	Separated	Widowed	Living together	Traditional marriage	Other: Specify				
5. What is your highest formal education level? ***(Circle one number only)***	None	Primary School	Std 6-8 Grade 8-10	Std 9-10 Grade 11-12	Tertiary education (1 year certificate)							
6. What is your employment status? ***(Circle one number only)***	Un-employed (looking for work)	Home-maker by choice (not looking for work)	Self-employed	Wage-earner	Self-employed professional	Other (Specify)						
7. Who decides on what types of food are bought for this household? **Chil**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other
8. Who decides how much money is spent on food for this household? **Chil**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other
9. Who is mainly responsible to buy food for the household? **Child'**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other
10. Who is mainly responsible for food preparation in the house? **Child**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other
11. Who is mainly responsible for feeding / serving the children? **Child**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other

12. List below the details of **all** the people living in the household, including people who are usual members of the household who are away (draw a line through the other columns to indicate that there are no other people in the household).

	1	2	3	4
12a. Relation to HH ***(NOT TO THE CHILD)***				
12b. Gender				
12c. Age				
12d. Marital status				
12e. Highest level of education				
12f. Occupation				
12g. Income last month				
12h. Lives away from household?				
12i. Work status ***(Answer yes or no)***				
12j. Where were they born?				
12k. Why moved to present location?				
12l. Health status / diagnosed diseases ***(Give the name of the disease if they know it, and yes, unknown if they do not know the disease)***				
12m. Where was main meal eaten yesterday?				
	5	6	7	8
12a. Relation to HH ***(NOT TO THE CHILD)***				
12b. Gender				
12c. Age				
12d. Marital status				
12e. Highest level of education				
12f. Occupation				
12g. Income last month				

12h. Lives away from household?				
12i. Work status (Answer yes or no)				
12j. Where were they born?				
12k. Why moved to present location?				
12l. Health status / diagnosed diseases (give the name of the disease if they know it, and yes, unknown if they do not know the disease)				
12m. Where was main meal eaten yesterday?				
	9	10	11	12
12a. Relation to HH ***(NOT TO THE CHILD)***				
12b. Gender				
12c. Age				
12d. Marital status				
12e. Highest level of education				
12f. Occupation				
12g. Income last month				
12h. Lives away from household?				
12i. Work status ***(Answer yes / no)***				
12j. Where were they born?				
12k. Why moved to present location?				
12l. Health status / diagnosed diseases ***(Give the name of the disease if they know it, and yes, unknown if they***				

do not know the disease)				
12m. Where was main meal eaten yesterday?				

13. How many children were born in the household during the last three years?	
14. How many children survived?	
15. How many children passed away within the first 3 years of their lives?	
16. In which year was the last child born?	

17. Has any person / s in the household past away during the last year?	Date of death	Gender	Age	Cause of death

Household data

18. Which one of the following housing types best describes the type of dwelling this household occupies ***(Do NOT read aloud – circle only ONE answer)***	**Housing type**
	House
	Town house
	Flat
	Hostel / Compound
	Hotel / Boarding house
	Room in backyard
	Room in house
	Room in flat
	Squatter hut / shack
	Mobile home
	Other: Specify

19. How many people sleep in this house for at least 4 nights per week for most of the year?	

20. How many rooms does this house have? (excluding bathroom, toilet and kitchen if separate)						
21. What is the number of people in the household per living / sleeping in a room (for inside and outside rooms) ***(Tick one)***		0-2 persons	3-4 Persons	More than 4 persons		
22. Where do the household get drinking water most of the time ***(Circle one number)***	Own tap	Communal tap	River / dam	Borehole / well	Other (Specify)	
23. What type of toilet does this household have? ***(Circle as many numbers as necessary)***	Flush	Pit / VP	Bucket / pot	None	Other (Specify)	
24. What fuel is used for cooking most of the time? ***(Circle as many numbers as necessary)***	Electric	Gas	Paraffin	Wood	Coal	Other (Specify)
25. Does this home have a working: Refrigerator / Freezer			Fridge	Freezer	Both	None
26. Stove (oven & hob)		Yes	No	If yes, circle all relevant options Gas Coal Electricity		
27. Primus or Paraffin stove					Yes	No
28. Microwave					Yes	No
29. Hot Plate					Yes	No
30. Radio / television			Radio	TV	Both	None
31. Telephone			Land line	Cell	Both	None

32. Household income from all sources (in the last one (1) month *a) Read list aloud, circle the one that applies and complete the information for that row; leave rows blank for categories that do not apply.* *b) Enter amount over the past **one (1) month to nearest** currency unit in column c. For income in kind i.e. Remittances – goods / food, income from farm products, estimate the monetary value over the past month).*	**a. Income categories**	**b. Amount**
	a. Wage work	
	b. Casual work	
	c. Remittances – Money	
	d. Remittances – Goods	
	e. Remittances – Foods	
	f. Income from selling rural farm products	
	g. Income from urban farm products	

	h. Income from formal business	
	i. Income from informal business	
	j. Income from renting dwelling	
	k. Income from aid – Food	
	Cash	
	Vouchers	
	l. Pension/disability/other social grants	
	m. Gifts	
	n. Other	
	o. Refused to answer	
	p. Don't know	

33. Do members of this household receive any grants? ***(You may circle more than one number)***	None	Child support	Social relief	Disability	Old age pension	Other (Specify)
34. Has anyone in the household worked in a food-related business in the last six months?					Yes	No

34 a. Which	Food production and agriculture	Food processing / packaging	Food transport	Food retail	Restaurant / fast food	Informal trading	Recycling / waste disposal	NA

35. Which member(s) of the family worked in a food-related business in the last six months? **Child's**	Father	Mother	Husband	Grandma	Grandpa	Aunt	Uncle	Brother	Sister	Friend	Self	Other

36. How many people contribute to the total income (money) in this household? ***(Circle one number only)***	1 person	2 persons	3-4 persons	5-6 persons	More than 6

37. What is the total household income per month (including wages, rent, grants, sales of vegetables etc) ***(Circle one number only)***	None	R1 - R500	R501 - R1000	R1001 - R3000	R3001 - R5000	Over R5000	Don't know

38. Is this the usual income of this household? ***(Circle one number only)***	Don't know	Yes	No	If no, what other income is available or what is not usually available, specify

39. Is this more or less than the income you had in the past six months? ***(Circle one number only)***	Don't know	More	Less	Same	Specify reasons if more or less

40. How much money is spent on food weekly or monthly? (including food eaten away from home) ***(Circle weekly or monthly)*** ***(Circle only one option)***	R0-50	51-R100	R101-R150	R151-R200	R201-R250	R251-R300	R301-R350	R351-R400	Over R400	Don't know

41. Do members of this household regularly receive food from a feeding scheme?	Yes	No

42. Household monthly expenses for **the last month.**
(Read list aloud, circle the code that applies and complete the information for that row; leave rows blanks for categories that do not apply; if an annual expense give a monthly estimate.)

Expense categories	**B). Amount**
a. Food and groceries	
b. Housing (rent, mortgage)	
c. Utilities (write total for all: water, sewer, electricity, telephone etc).	
d. Cell phone expenses	
e. Clothing	
f. Household goods and appliances	
g. Transportation	
h. Savings	
i. Fuel (firewood, paraffin, gas, candles etc).	
j. Medical (medical aid, medical costs)	
k. Education (school fees, books, uniforms)	
l. Insurance (life, burial etc)	
m. Funeral costs	
n. Home-based care	
o. Remittances	
p. Debt services	
q. Goods purchased to sell	
r. Other (specify)	
s. NONE	
t. Refused to answer	

43. To what extent do people in your household use strategies other than jobs (regular formal employment) to make a living?
Use the code list below to report the extent to which people in the household use other strategies:
1 = Not applicable
2 = Not at all
3 = Some times
4 = Partly dependent
5 = Totally / fully dependent

Way to make a living	**Code**
a. Field crops	
b. Garden crops	
c. Tree crops	
d. Livestock	
e. Marketing / Vending	

(Record the appropriate code in the last column.)	f. Crafts	
	g. Begging	
	h. Gifts	
	i. Casual labor	
	j. Rent out space to lodgers	
	k. Formal credit	
	l. Informal credit	
	m. Self-employed at home	
	n. Other (specify)	

44. How would you say the economic condition of your household is today compared to your household a year ago? ***(Circle one answer only)***	**Economic conditions**
	Much worse
	Worse
	The same
	Better
	Much better

45. Living Poverty Index

Over the past month, how often, if ever, have you or your family had:

(Read each question aloud and circle the most appropriate response. Circle only ONE answer for each row)

Conditions						
Enough food to eat?	Never	Just once or twice	Several times	Many times	Always	Don't know
Enough clean water for home use?	Never	Just once or twice	Several times	Many times	Always	Don't know
Medicine or medical treatment?	Never	Just once or twice	Several times	Many times	Always	Don't know
Electricity in your home?	Never	Just once or twice	Several times	Many times	Always	Don't know
Enough fuel to cook your food?	Never	Just once or twice	Several times	Many times	Always	Don't know
A cash income?	Never	Just once or twice	Several times	Many times	Always	Don't know

46. Does this household have a person or persons living and working elsewhere?	Yes	No

(If this household has a member living and working elsewhere – a migrant worker – proceed to section below.)		

47. Do you think that this household has been affected positively or negatively by having a person(s) living and working elsewhere? ***(Probe for strength of opinion; circle only ONE answer)***	**Effect on household** Very positive Positive Neither positive or negative Negative Very negative Not applicable Don't know (do not read)
48. How important are remittances (cash, food and goods) for the survival of this household in the following ways? ***(Probe for strength of opinion; circle only ONE answer)***	**Importance of remittances** Very important Important Neutral Not important Not important at all Not applicable Don't know
49. If other members of this household were to migrate to another location to work, do you think this household would be: ***(Probe for strength of opinion; circle only ONE answer)***	**Condition of household** Better off About the same Worse off Not applicable Don't know

ADDENDUM B: Household Food Insecurity Access Scale

Nr	Question	Response options	Answer
1.	In the past four weeks, did you **worry** that your household would not have enough food?	No (skip to Q 2) Yes	
1.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
2.	In the past four weeks, were you or any household member **not able to eat the kinds of foods you preferred** because of a **lack of resources?**	No (skip to Q 3) Yes	
2.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
3.	In the past four weeks, did you or any household member have to eat **a limited variety** of foods due to a lack of resources?	No (skip to Q 4) Yes	
3.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
4.	In the past four weeks, did you or any household member have to eat **some foods that you really did not want to eat** because of a **lack of resources** to obtain other types of food?	No (skip to Q 5) Yes	
4.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
5.	In the past four weeks, did you or any household member have to eat a **smaller meal** than you felt you needed because there was not enough food?	No (skip to Q 6) Yes	
5.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
6.	In the past four weeks, did you or any other household member have to **eat fewer meals** in a day because there was not enough food?	No (skip to Q 7) Yes	
6.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four	

		weeks)	
7.	In the past four weeks, was there ever **no food** to eat of any kind in your household because of a **lack of resources** to get food?	No (skip to Q 8) Yes	
7.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
8.	In the past four weeks, did you or any household member go to **sleep at night hungry** because there was **not enough food**?	No (skip to Q 9) Yes	
8.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	
9.	In the past four weeks, did you or any household member go a **whole day and night without eating** anything because there was **not enough food**?	No (questionnaire is finished) Yes	
9.a.	How often did this happen?	Rarely (once or twice in the past four weeks) Sometimes (three to ten times in the past four weeks) Often (more than ten times in the past four weeks)	

ADDENDUM C: Dietary diversity questionnaire of the mother / caregiver

Please describe the foods (meals and snacks) that you ate **yesterday** during the day and night, whether at home or outside the home. Start with the first food eaten in the morning.

Write down all food and drinks mentioned by the respondent. When the respondent has finished, probe for meals and snacks not mentioned.

Breakfast	Snack	Lunch	Snack	Supper	Snack

When you have completed the respondent's recall, fill in the food groups based on the information recorded above. For any food groups not mentioned, ask the respondent if a food item from this group was consumed.

Number	Food group	Examples of the food	Yes / No
1.	Cereals	Maize, rice, wheat, sorghum, oats or any other grains or foods made from these (e.g. bread, *vetkoek*, dumplings, porridge, stiff *pap* or crumbly *pap*, mealie rice, samp, whole kernels, pasta or other grain products)	
2.	Vitamin rich vegetables	Pumpkin, carrots, squash, or sweet potatoes that are orange inside	
3.	White vegetables and roots	Potatoes, turnips	
4.	Dark green leafy vegetables	Dark green/leafy vegetables, spinach or *imifino* (even if mixed with maize), leaves of carrots, leaves of beetroot, broccoli or Brussels sprouts, peas.	
5.	Other vegetables	Tomato, onion, eggplant, cabbage, cauliflower, marrow, baby marrow, lettuce, cucumber, gem squash.	
6.	Vitamin A rich fruit	Ripe mangoes, apricots, papaya, peaches, guavas	
7.	Other fruit	Apples, bananas, pears, wild fruit, grapes, oranges, naartjies	
8.	Organ meat	Beef of sheep liver, chicken livers, kidney, heart, tripe	
9.	Flesh meats	Beef, pork, lamb, goat, rabbit, wild game, chicken, duck, or other birds	
10.	Eggs	Chicken, duck, guinea hen or any other egg	
11.	Fish	Fresh or dried fish or shellfish	
12.	Legumes, nuts and seeds	Beans, peas, lentils, nuts, seeds or foods made from these	
13.	Milk and milk products	Milk, cheese, yogurt, *amagewu (marhewu), inqodi* or other milk products	
14.	Oils and fats	Oil, fats or butter, *holsum,* animal fat added to food or used for cooking, Cremora, Ellis Brown etc.	
15.	Sweets	Sugar, honey, sweetened soda or sugary foods such as chocolates, candies, cookies and cakes	
16.	Spices, condiments and beverages	Spices (black pepper, salt, curry), condiments (soy sauce, hot sauce, *aromat*), coffee, tea, cold drink, water, drink-o-pop, Oros, alcoholic beverages etc	

Addendum: D – Information and consent form to be completed by mothers and caregivers

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

A community nutrition security research project in the Breede Valley, Western Cape Province, South Africa

REFERENCE NUMBER: (N10/11/368).

PRINCIPAL INVESTIGATOR: Prof M.H. McLachlan
ADDRESS: Division of Human Nutrition
Room 3085
Clinical Building
Faculty of Health Sciences
Stellenbosch University
Tygerberg campus

CONTACT NUMBER: 021 938-9259

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee (HREC) at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study will be done in two communities, Avian Park and Zweletemba in the Breede Valley of the Western Cape. The study will include a total of 400 children between 0 – 3 years as well as their mothers / caregivers.

The aim of this research project is to gather information about the nutritional health status of young children (0 – 3 years) and their mothers / caregivers in these two areas. The information will help the researchers understand what the factors are that influences you and your children's health. This information will help the researchers to find ways to improve the food and nutrition situation in your area.

We would like to invite you to take part in this study. One part of the study will look at the different things that influence whether there is at all times enough healthy food for everyone in the household, as well as the eating patterns of the child and his / her mother / caregiver. If you agree to participate, the fieldworkers will complete some questionnaires with your help. These questionnaires will focus on:

- information of the household and its members,
- food items in the house, when and where it was bought;
- food items and dishes eaten by the child and mother / caregiver.

The fieldworkers will also weigh you and measure your height and waist thickness.

Furthermore, we will take a blood sample from you. This blood will then be analysed by the African Micronutrient Research Group (AMRG) located at Tygerberg hospital and the National Health Laboratory Services (NHLS) also located at Tygerberg hospital. These samples will be analysed for:

- Vitamin A;
- Vitamin D;
- Folate;
- Ferritin;
- Zinc;
- Haemoglobin;
- C - reactive protein.

The results of these analyses will provide the researchers with valuable information regarding the nutritional status of the child and mother / caregiver. These blood samples will not be analysed or used for any other purpose than stated above. All blood samples left after analyses will be stored at the AMRG laboratory in a locked freezer in a secure room. Blood samples will be destroyed after one year of collection.

It is important to remember that the blood analyses will not be used to diagnose any diseases. However, if after analysis the results indicate that you need to see a doctor, the research team will inform you. Results from the whole community will be given to all participants after conclusion of the study. This will be at a venue in the area (such as

a multi-purpose centre, crèche, school, church or clinic). All community members will be allowed to attend this meeting.

You will be able to withdraw yourself at any time during the study. If you do decide to withdraw, all blood samples that has not been analysed yet will be destroyed.

Please remember that there are no right or wrong answers.

This study will NOT be testing any medicine.

Why have you been invited to participate?

You have been chosen to participate in this study because you live in either Avian Park or Zweletemba and because your child is younger than 3 years.

We have used a way to choose addresses of houses in Avian Park and Zweletemba so that all houses had the same chance of being chosen. If the household has a child younger than 36 months we include the mother / caregiver and this is how you have been selected to participate.

What will your responsibilities be?

We will ask you questions about the household, the child and yourself regarding the buying, cooking and eating of food. Please answer honestly and clearly. We will fill in these question forms in your home.

We will also expect you to provide a blood sample. On the day of blood collection you can continue will all normal household activities – such as breakfast – as there will be no special requirements for the collection process.

Will you benefit from taking part in this research?

You will benefit indirectly from participating in the study, because it will help us gather information regarding the nutritional status of children and their mothers / caregivers and dietary habits in households in these communities. This information will help us to work with leaders and organizations in the communities to develop and implement plans to improve the food situation and therefore the nutritional status of the residents in these communities. We will make a contribution to the local registered crèches in the communities to thank you for your participation.

Are there in risks involved in your taking part in this research?

The procedures followed in this study are generally safe and without side effects but you may experience some discomfort when blood is drawn (needle stick and bruising).

If you do not agree to take part, what alternatives do you have?

If you decide not to participate in this study, and you need more information about nutrition and healthy eating, you are welcome to get information at the local clinic or any other health care facility.

Who will have access to your personal records?

All information provided by you will be private. You will get a study number that will be placed on your completed question form. Nobody other than the researchers will see the individual, personal information. [To enable them to contact you if needed, only the researchers will be able to link your name to your answers and they will not share this information with anybody else.]

The results may however be used for publication in a scientific journal or for presentation at a scientific congress, without revealing your name.

What will happen in the unlikely event of some form injury occurring as a direct result of your taking part in this research study?

It is not expected that taking part in this study will cause any harm or injury to you. However, if you do not feel well or develop a problem that requires medical attention, please call the researcher as soon as possible.

Will you be paid to take part in this study and are there any costs involved?

Taking part in this study will not cost you anything. Also, the study researchers will not pay any fees to you to take part. We will, however, contribute to one / more of the local registered crèches in the communities.

Is there anything else that you should know or do?

• You can phone Prof McLachlan or any of the researchers at tell 021 938-9259 if you have any further questions or if you have any problems.

• You can also contact the Health Research Ethics Committee at 021-938 9207 if you have any worries or complaints that have not been answered by the research team.

• You will receive a copy of this information and consent form for your own records.

Declaration by participant

By signing below, I …….…….. agree to take part in a research study with the title: A community nutrition security research project in the Breede Valley, Western Cape Province, South Africa.

.

I declare that:

• I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

• I have had a chance to ask questions and all my questions have been adequately answered.

• I understand that taking part in this study is voluntary and I have not been pressurised to take part.

• I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

• I may be asked to leave the study before it has finished, if the study doctor or researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) .....……. on (date) ……..…….. 2011.

Signature of participant **Signature of witness**

Declaration by investigator

I, ...declare that:

• I explained the information in this document to …….....……..

• I encouraged him/her to ask questions and took adequate time to answer them.

• I am satisfied that he/she adequately understands all aspects of the research, as discussed above

• I did / did not use an interpreter. (If an interpreter is used then the interpreter must sign the declaration below.

Signed at (place) .....……. on (date) ……..…….. 2011.

Signature of investigator **Signature of witness**

Declaration by interpreter

I (name) ……..…… declare that:

• I assisted the investigator ..... to explain the information in this document to (name of participant) ……..……..…….. using the language medium of Afrikaans / Xhosa.
• We encouraged him/her to ask questions and took adequate time to answer them.
• I conveyed a factually correct version of what was related to me.
• I am satisfied that the participant fully understands the content of this informed consent document and has had all his/her question satisfactorily answered.

Signed at (place) .....…..…….. on (date)
……..……2011.

Signature of interpreter **Signature of witness**

ADDENDUM: E – Information and consent form to be completed by mothers of children 3 years or younger

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

A community nutrition security research project in the Breede Valley, Western Cape Province, South Africa

REFERENCE NUMBER: (N10/11/368).
PRINCIPAL INVESTIGATOR: M.H. McLachlan
ADDRESS: Division of Human Nutrition
Room 3085
Clinical Building
Faculty of Health Sciences
Stellenbosch University
Tygerberg campus

CONTACT NUMBER: 021 938-9259

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee (HREC) at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study will be done in two communities, Avian Park and Zweletemba in the Breede Valley of the Western Cape. The study will include a total of 400 children between 0 – 3 years as well as their mothers / caregivers.

The aim of this research project is to gather information about the nutritional health status of young children (0 – 3 years) and their mothers / caregivers in these two areas. The information will help the researchers to understand the factors that influence you and your children's health. This information will help the researchers to find ways to improve the food and nutrition situation in your area.

We would like to invite your child to take part in this study. One part of the study will look at the different things that influence whether there is at all times enough healthy food for everyone in the household, as well as the eating patterns of the child and his / her mother.

If you agree to let your child participate, the fieldworkers will complete some questionnaires with his / her help. These questionnaires will focus on:

- information of the household and its members,
- food items in the house, when and where it was bought;
- food items and dishes eaten by the child and his / her mother / caregiver.

The fieldworkers will also weigh and measure your child's length of the body, head and arm thickness.

Furthermore, we will take a blood sample from him / her, unless the child weighs less than 6 kg or are younger than 1 year. This blood will then be tested by the African Micronutrient Research Group (AMRG) at Tygerberg hospital and the National Health Laboratory Services (NHLS) also at Tygerberg hospital. These samples will be tested for:

- Vitamin A;
- Vitamin D;
- Folate;
- Ferritin;
- Zinc;
- Haemoglobin;
- C - reactive protein.

The results of these analyses will provide the researchers with valuable information about the nutritional status of your child. These blood tests will not be tested or used for any other purpose than stated above. All blood samples left after testing will be stored at the AMRG laboratory in a locked freezer in a secure room. Blood samples will be destroyed after one year of collection.

It is important to remember that the blood tests will not be used to name any diseases. However, if after testing the results indicate that your child needs to see a doctor, the research team will tell you. The information about the whole community's health will be reported back to the community after the study is over. This report back will be at a venue in the community (such as a multi-purpose crèche, school, church or clinic). All community members will be allowed to attend this meeting.

You will be able to withdraw your child at any time during the study. If you do decide to withdraw, all blood samples that has not been analysed yet will be destroyed.

Please remember that there are no right or wrong answers.

This study will NOT be testing any medicine.

Why have your child been invited to participate?

Your child has been chosen to participate in this study because he / she lives in either Avian Park or Zweletemba and because he / her child is younger than 3 years.
We have used a way to choose addresses of houses in Avian Park and Zweletemba so that all houses had the same chance of being chosen. If the household has a child younger than 3 years we include the mother / caregiver and this is how he / she has been selected to participate.

What will your responsibilities be?

We will ask you questions about the household, the child and yourself regarding the buying, cooking and eating of food. Please answer honestly and clearly. We will fill in these question forms in your home.

We will also expect him / her to give a blood sample. On the day of blood collection you can continue with all normal household activities – such as breakfast – as there will be no special requirements for the collection process.

Will he / she benefit from taking part in this research?

He / she will benefit indirectly from participating in the study, because it will help us gather information regarding the nutritional status of children and their mothers / caregivers and dietary habits in households in these communities. This information will help us to work with leaders and organizations in the communities to make plans to better the food situation and therefore the nutrition of the people in these communities. We will make a contribution to the local registered crèches in the communities to thank you for your participation.

Are there in risks involved in him / her taking part in this research?

The procedures followed in this study are generally safe and without side effects but he / she may experience some discomfort when blood is drawn (needle stick and bruising).

If you do not agree to take part, what alternatives do you have?

If you decide not to participate in this study, and you need more information about nutrition and healthy eating, you are welcome to get information at the local clinic or any other health care facility.

Who will have access to your child's personal records?

All information provided by you will be private. He / she will be getting a study number that will be placed on her completed question forms. Nobody other than the researchers will see the individual, personal information. [To enable them to contact you if needed, only the researchers will be able to link her / your name to your answers and they will not share this information with anybody else.]
The results may however be used for publication in a scientific journal or for presentation at a scientific congress, without revealing his / her name.

What will happen in the unlikely event of some form injury occurring as a direct result of your child taking part in this research study?

It is not expected that taking part in this study will cause any harm or injury to your child. However, if he / she does not feel well or develop a problem that requires medical attention, please call the researcher as soon as possible.

Will you be paid to let your child take part in this study and are there any costs involved?
Taking part in this study will not cost you anything. Also, the study researchers will not pay any fees to you to take part. We will, however, contribute to one / more of the local registered crèches in the communities.

Is there anything else that you should know or do?

• You can phone Prof McLachlan or any of the researchers at tell 021 938-9259 if you have any further questions or if you have any problems.

• You can also contact the Health Research Ethics Committee at 021-938 9207 if you have any worries or complaints that have not been adequately addressed by the researcher.

• You will receive a copy of this information and consent form for you own records.

Declaration by participant

By signing below, I …….. agree to allow my child (younger than 3 years of age) to take part in a research study with the title: A community nutrition security research project in the Breede Valley, Western Cape Province, South Africa.

.

I declare that:

• I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

• I have had a chance to ask questions and all my questions have been adequately answered.

• I understand that allowing my child to take part in this study is voluntary and I have not been pressurised to take part.

• I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

• He / she may be asked to leave the study before it has finished, if the researcher feels it is in his / her best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) .....……. on (date) ……..…….. 2011.

Signature of parent **Signature of witness**

Declaration by investigator

I, ... declare that:

• I explained the information in this document to

…….....……..

• I encouraged him/her to ask questions and took adequate time to answer them.

• I am satisfied that he/she adequately understands all aspects of the research, as discussed above

• I did / did not use an interpreter. (If an interpreter is used then the interpreter must sign the declaration below.

Signed at (place) .....…..……. on (date) ……..…….. 2011.

Signature of investigator **Signature of witness**

Addendum: F – Information and consent form to be completed by the person primarily responsible for making household decisions regarding food

PARTICIPANT INFORMATION LEAFLET AND CONSENT FORM

A community nutrition security research project in the Breede Valley, Western Cape Province, South Africa

REFERENCE NUMBER: (N10/11/368).
PRINCIPAL INVESTIGATOR: M.H. McLachlan
ADDRESS: Division of Human Nutrition
Room 3085
Clinical Building
Faculty of Health Sciences
Stellenbosch University
Tygerberg campus

CONTACT NUMBER: 021 938-9259

You are being invited to take part in a research project. Please take some time to read the information presented here, which will explain the details of this project. Please ask the study staff any questions about any part of this project that you do not fully understand. It is very important that you are fully satisfied that you clearly understand what this research entails and how you could be involved. Also, your participation is entirely voluntary and you are free to decline to participate. If you say no, this will not affect you negatively in any way whatsoever. You are also free to withdraw from the study at any point, even if you do agree to take part.

This study has been approved by the Health Research Ethics Committee (HREC) at Stellenbosch University and will be conducted according to the ethical guidelines and principles of the international Declaration of Helsinki, South African Guidelines for Good Clinical Practice and the Medical Research Council (MRC) Ethical Guidelines for Research.

What is this research study all about?

This study will be done in two communities, Avian Park and Zweletemba in the Breede Valley of the Western Cape. The study will include a total of 400 children between 0 – 3 years as well as their mothers / caregivers.

The aim of this research project is to gather information about the nutritional health of young children (0 – 3 years) and their mothers / caregivers in these two areas. The information will help the researchers to understand the factors that influence the children and their mother's / caregiver's health status. This information will help the researcher to find ways to improve the food and nutrition situation in your area.

We would like to invite you to take part in this study. One part of the study will look at the different things that influence whether there is at all times enough healthy food for everyone in the household, as well as the eating patterns of the people in your household.

If you agree to participate, the fieldworkers will complete some questionnaires with your help. These questionnaires will focus on:

- information of the household and its members,
- food items in the house, when and where it was bought;

Please remember that there are no right or wrong answers.

This study will NOT be testing any medicine.

Why have you been invited to participate?

You have been chosen to participate in this study because you live in either Avian Park or Zweletemba and because your household have a child younger than 3 years.

We have used a way to choose addresses of houses in Avian Park and Zweletemba so that all houses had the same chance of being chosen. If the household has a child younger than 3 years we include the mother / caregiver and this is how you have been chosen to participate.

What will your responsibilities be?

We will ask you questions about the household, regarding the buying, cooking and eating of food. Please answer honestly and clearly. We will complete these question forms at your home.

Will you benefit from taking part in this research?

You will benefit indirectly from participating in the study, because it will help us gather information regarding the nutritional status of children and their mothers / caregivers

and dietary habits in households in these communities. This information will help us to work with leaders and organizations in the communities to make plans to better the food situation and therefore the nutritional status of the residents in these communities. We will make a donation to the local registered crèches in the communities to thank you for your participation.

Are there in risks involved in taking part in this research?

To my knowledge, participating in this study would not include any risks to you.

If you do not agree to take part, what alternatives do you have?

If you decide not to participate in this study, and you need more information about nutrition and healthy eating, you are welcome to get information at the local clinic or any other health care facility.

Who will have access to your personal records?

All information provided by you will be private. You will be getting a study number which will be placed on the completed question forms. Nobody other than the researchers will see individual, personal information. [To enable them to contact you if needed, only the researchers will be able to link your name to your answers and they will not share this information with anybody else.]
The results may however be used for publication in a scientific journal or for presentation at a scientific congress, without revealing your name.

What will happen in the unlikely event of some form injury occurring as a direct result of you taking part in this research study?

It is not expected that taking part in this study will cause any harm or injury to you. However, if you do not feel well or develop a problem that requires medical attention, please call the researcher as soon as possible.

Will you be paid to take part in this study and are there any costs involved?

Taking part in this study will not cost you anything. Also, the study researchers will not pay any fees to you to take part. We will, however, contribute to one / more of the local registered crèches in the communities.

Is there anything else that you should know or do?

• You can phone Prof McLachlan or any of the researchers at tell 021 938-9259 if you have any further queries or encounter any problems.

• You can also phone the Health Research Ethics Committee at 021-938 9207 if you have any concerns or complaints that have not been adequately addressed by the researcher.

• You will receive a copy of this information and consent form for you own records.

Declaration by participant

By signing below, I …….…….. agree to take part in a research study entitled: A community nutrition security research project in the Breede Valley, Western Cape Province, South Africa.

.

I declare that:

• I have read or had read to me this information and consent form and it is written in a language with which I am fluent and comfortable.

• I have had a chance to ask questions and all my questions have been adequately answered.

• I understand that allowing my grandchild to take part in this study is voluntary and I have not been pressurised to take part.

• I may choose to leave the study at any time and will not be penalised or prejudiced in any way.

• I may be asked to leave the study before it has finished, if the researcher feels it is in my best interests, or if I do not follow the study plan, as agreed to.

Signed at (place) .....……. on (date) ……..…….. 2011.

Signature of participant **Signature of witness**

Declaration by investigator

I,..... declare that:

• I explained the information in this document to ……..

• I encouraged him/her to ask questions and took adequate time to answer them.

• I am satisfied that he/she adequately understands all aspects of the research, as discussed above

• I did / did not use an interpreter. (If an interpreter is used then the interpreter must sign the declaration below.

Signed at (place) .....…….....…….. on (date) ……..…….. 2011.

Signature of investigator **Signature of witness**